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Surgery, Gynecology and Obstetrics

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International Abstract of Surgery

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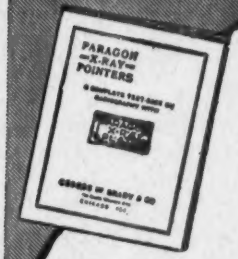

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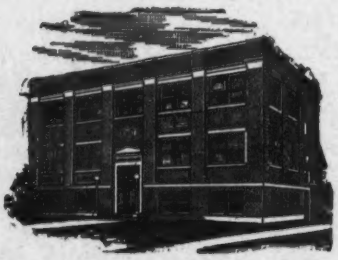

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PANCREATIC LYMPHANGITIS

WITH AND WITHOUT JAUNDICE[1]*

BY JOHN B. DEAVER, M.D., F.A.C.S., PHILADELPHIA

DURING the past decade disease of the pancreas has been productive of a considerable amount of literature for some of which I have to acknowledge responsibility. The pancreas is so commonly involved at operation for upper abdominal conditions that I have thought it worth while again to direct attention to it and to consider the relation between the pancreatic lymph glands and other abdominal viscera.

The gall-bladder, bile-ducts, pyloric region of the intestines and the second part of the duodenum, through their efferent lymph channels, are placed in intimate relation to the head of the pancreas, and it is the head of the pancreas that is most frequently involved in pancreatitis associated with other upper abdominal diseases. The course of infection has time and again been observed at the operating table in gall-bladder diseases. Inflammation of the gall-bladder is followed by enlargement of the cystic lymph glands, periductal lymphangitis, enlargement of the glands at the head and at the margin of the pancreas and often of the regional lymph channels at the head of the pancreas.

"The lymph drainage from the head of the pancreas passes through the lymph glands of the common and hepatic ducts. A cholecystitis causing great enlargement of these glands can produce pressure and jaundice, or a lymphœdema or a lymph-borne infection of the head of the pancreas, just as at times lymphœdema is seen in the arm following amputation of the breast and removal of the axillary glands. The gland group in both instances drains three regions."[2]

Induration of the head of the pancreas about the common duct is present in 35 to 40 per cent of diseases of the gall-bladder, not only in cases with common duct stone, but also in many cases where the gall-bladder is only slightly diseased but in which there is enlargement of the lymph glands draining the gall-bladder, and also in a number of cases of strawberry gall-bladder with or without stones.

In the course of my abdominal work I am becoming more and more convinced that the first stage of chronic pancreatitis is nearly always disease of the pancreatic lymph glands. This primary disorder can rarely, if ever, be diagnosed before operation, nor is a preoperative diagnosis of chronic pancreatitis always possible. In both conditions the predominant symptoms are those of some upper abdominal disease, with which they are more often than not associated, principally gall-bladder disease, peptic ulcer, disease of the liver, or appendicitis. In the absence of definite indications of calculi, the appearance of jaundice serves to suggest the possible cause of the trouble. The onset of jaundice in these cases, as a rule, is gradual and its

[2] C. J. Mayo, Collected Papers, Mayo Clinic, 1916, viii, 280.

[1] Read by title before the Southern Surgical Association, Baltimore, December, 17–19, 1918.

intensity, variable at first, is apt to be more constant than when due to stone or stones in the common duct. The difficulties of diagnosis are illustrated by the following cases, recently operated upon by me at the Hospital of the University of Pennsylvania:

The patient, male, aged 18 years, gave as his chief complaint jaundice, nausea, and pain and weakness of the muscles of the lower extremities.

The pain began four days before admission and two days later jaundice set in, first on the face and then covering the entire body, the skin becoming a muddy yellow. There was considerable nausea, vomiting, some spitting of blood, dizziness and languor.

Physical examination in addition to the jaundice showed slight epigastric pulsations, absence of peristalsis, abnormal breathing. No areas of tenderness were noted. The liver was palpated at the costal margin, liver dullness was percussed 8 centimeters below the costal margin. The liver extended from the eighth rib to the end of the costal margin in the right mammary line.

Two days after admission the patient vomited medicine, food, and a small amount of blood. Vomiting and evidence of bleeding continued at intervals for several days. The symptoms finally yielded to treatment and the patient was able to go home much improved one month after admission. Nineteen days later he returned, giving a history of having vomited two days previously, but which he attributed to dietary indiscretions. Jaundice was still marked, and general weakness and stiffness of the lower extremities were present. He also complained of bladder irritability and nocturnal frequency.

Examination showed an increased enlargement of the liver which was found to extend four finger breadths below the costal margin. Palpation of the gall-bladder was doubtful. There was some tenderness over Mayo-Robson's point. The patient later became stuporous, and the temperature rose to above 104°F. Vomiting continued. The attending physician diagnosed enlargement of the gall-bladder and referred the patient to me for operation. I found the gall-bladder to be slightly enlarged but normal in appearance. The bile in the gall-bladder also was apparently normal, but its mucous membrane was granular in appearance. The pancreas was enlarged and slightly congested. The liver was very large and congested. Adhesions between the gall-bladder and the duodenum gave evidence of old inflammation of the gall-ducts. Our operative diagnosis was, therefore, acute obstructive cholangitis. Operation consisted of draining the gall-bladder. The postoperative course was most stormy, variations in temperature giving a genuine "steeple chart." The patient finally got well.

E. A. Graham[1] has recently demonstrated that enlargement of the liver is a feature in 87 per cent of cases with disease of the biliary tract; a rather too large percentage I am inclined to think. Nevertheless he finds that this enlargement occurs regardless of whether or not calculi are present or whether or not there is obstruction of the cystic duct, and states that, "if cholecystitis is well-established it is very probable that ascending infection of the liver may constantly recur, possibly through the lymphatics surrounding the bile passages." We all know that a gall-bladder once infected rarely regains its normal condition. Its walls have a tendency to harbor bacteria, which in turn may lead to infection of the liver through the lymph channels around the biliary tract.

The following case recently operated upon by me at the Lankenau Hospital well shows pancreatic lymphangitis as the precursor of a pancreatitis which was without doubt obviated by operation.

The patient, a married woman aged 42 years, gave a history of eleven years of abdominal pain often severe enough to require morphia for relief. There was no constancy in the time of the attacks, nor was there any relation to food intake. Four days before admission she experienced one of the very severe attacks, and after this became slightly jaundiced. There was no history of vomiting or nausea during the attacks.

Her youngest child is eighteen months old; pregnancy was normal.

Physical examination showed jaundice involving the entire body. The tongue was covered with a thick grayish coating. Teeth fair. Abdomen: tenderness in the gall-bladder area and increased rigidity in upper right rectus. Diagnosis: gall-bladder disease.

A severe attack of pain the day after admission required morphia for relief. Jaundice increased. At operation the following day, the liver was found to be enlarged and congested. The gall-bladder distended and chronically inflamed. The gall-bladder was removed and when opened was found to contain muddy bile and many stones. The cystic duct was opened and muddy bile exuded. Some adhesions around the hepatic flexure of the colon were released. The pancreatic lymph glands were very much enlarged. The head of the pancreas was slightly enlarged. A chronically inflamed appendix was removed. Jaundice began clearing the day after operation. The patient is still in the hospital and is doing well.

These pancreatic and peripancreatic inflammations as I have elsewhere pointed out, are comparable to cervical adenitis following

[1] Surg., Gynec. & Obst., 1918, xxvi, 521.

tonsillitis, or inguinal adenitis after an infection of the extremity. The subsidence of the infection in the gall-bladder is steadily followed by subsidence of the lymphangitis. In view of the fact that in the present state of surgery we have no successful means of directly attacking the chronically diseased pancreas, it is obvious that early treatment of this "prepancreatitis," if I may coin the term, is most desirable. Medical treatment is slow, not always successful, and offers no assurance of freedom from recurrence. Surgery gives reasonable assurance of removing all foci of infection and consequent freedom of recurrence.

Disease of the prepancreatic lymph glands without jaundice is demonstrated in the following instance.

Male, age 39, admitted to the Lankenau Hospital, complaining of upper abdominal distress after eating. The history shows seven years of periodic attacks of epigastric pain four to six hours after meals, relieved by alkalis. Also nocturnal pain relieved by food. There is no constipation; no history of jaundice nor of gall-stone colic; no nausea or vomiting. Physical examination is negative except for the abdomen. The abdominal wall is relaxed; peristalsis active. The stomach capacity is 2700 cubic centimeters. We were unable to wash out the stomach entirely. The stomach is slightly ptosed. X-ray confirmed gastroptosis and demonstrated pyloric obstruction. Diagnosis: duodenal ulcer. At operation, adhesions running across the duodenum to the gall-bladder causing partial obstruction were released. There were enlarged glands along the neck of the gall-bladder and along the common duct. A spastic hourglass contraction of the duodenum relaxed under manipulation.

The peripancreatic lymph glands were enlarged and hard. The head of the pancreas was large and hard. Some perisplenic adhesions were released. A large chronic indurated ulcer was present at the junction of the pylorus and duodenum, the injection extending down into the duodenum and upward along the lesser curvature of the stomach. An anterior gastrostomy brought to view a large bleeding ulcer, one inch in diameter. Considerable blood was found in the stomach. The opening in the stomach was closed with chromic gut and linen. Posterior gastro-enterostomy was done. A chronically diseased gall-bladder was removed. The cystic and common ducts were found to be patulous. A fibrous appendix was removed. This patient made an uneventful recovery and has been entirely relieved of his symptoms.

Without enlarging upon the pathology and the surgical details of the question, I have cited these cases in order to emphasize the importance of early surgical treatment of upper abdominal disease before a possible pancreatitis has time to get in its destructive work.

PRACTICAL CONSIDERATIONS WITH REGARD TO PERMANENT COLOSTOMIES[1]

By W. E. SISTRUNK, M.D., F.A.C.S., Rochester, Minnesota
From the Mayo Clinic

EACH year we see a number of patients in whom we find it necessary to make permanent colostomies. As a rule, these colostomies are made in certain patients selected from a group of cases in which it has been found necessary to excise the rectum and sphincter muscles for cancer, and in cases of inoperable cancer of the rectum. The patients thus operated on have given us excellent opportunities to test the various types of operations and to note the annoying conditions which may arise following a permanent colostomy.

In reviewing briefly the anatomy of the lower colon, it will be remembered that the posterior one-third of the descending colon from the splenic flexure to the sigmoid, usually lies behind the peritoneum. This portion of the bowel has, as a rule, a very short mesentery, and often is more or less fixed to the posterior abdominal wall. Near the beginning of the sigmoid flexure the peritoneum completely surrounds the bowel, and the mesentery supplying this portion becomes much longer; it usually measures from three to six inches in length.

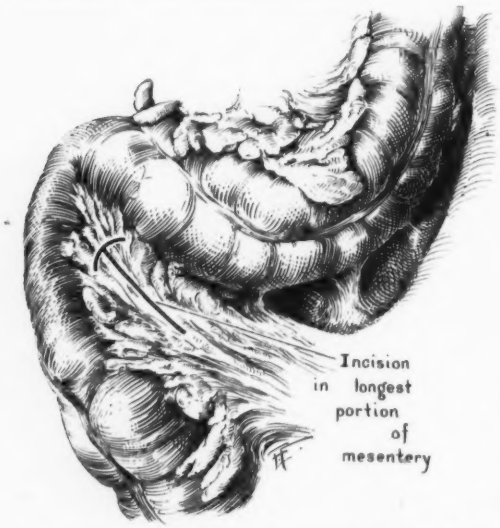

Fig. 1. Near view of sigmoid flexure showing the long mesentery in comparison with the short mesentery above it, and also the incision in the mesentery when the sigmoid flexure is used for making a colostomy.

Nearly every type of colostomy that has been suggested and that seemed practical has been used in the Mayo Clinic, but up to the present time, operations or procedures undertaken with an idea of giving the patient control of the bowel passages have almost always proved disappointing. Until recently we made the majority of colostomies through an oblique, muscle-splitting incision in the left inguinal region. The loop of bowel brought up for the colostomy was supported by a glass rod, a rubber tube, a piece of skin or silk-worm sutures, and was cut across five or six days following the operation. Many of the colostomies made in this manner were perfectly satisfactory. In a few of the cases there was a tendency toward the development of a ventral hernia into the tissues surrounding the colostomy. More frequently, however, the tendency has been toward a retraction of the loop of bowel in which the colostomy was made, allowing in some instances, the proximal end of the bowel to discharge a part of its contents into the distal end. We also have found, in instances in which the bowel was cut off at or near the level of the skin, that there is a tendency on the part of the skin to contract around the opening in the bowel, thus narrowing it sufficiently to interfere with the proper discharge of fæces. In looking back on the group of colostomies made in this manner it is easy to explain the reasons for the development of most of these conditions. The incision was made over a portion of the bowel which was more or less fixed, and if the sigmoid flexure was pulled up and used as a loop for the colostomy this was often ele-

[1] Presented before the Southern Surgical Association. Baltimore, December 17-19, 1918.

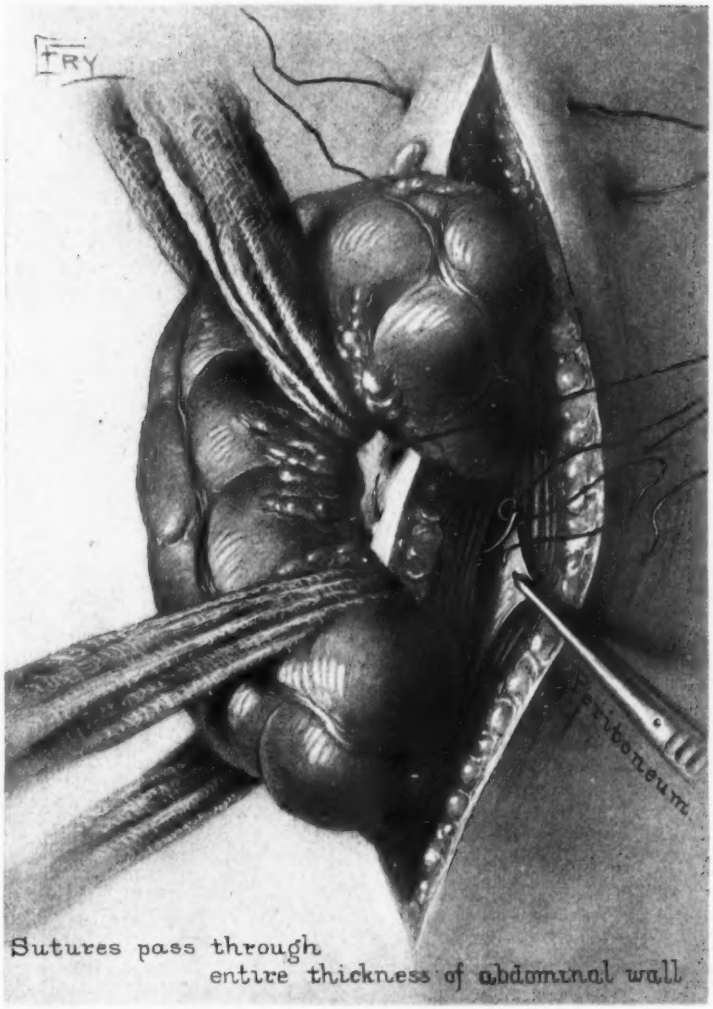

Fig. 2. Edges of the opening in the mesentery of the sigmoid being held widely apart by gauze while a portion of abdominal wall is being closed through the opening.

vated with considerable difficulty. After the colostomy had been made, the edges of the abdominal wall were separated for a distance of from two to three inches by two limbs of bowel and the mesentery supplying the loop used for the colostomy. This, naturally, left a large opening through the abdominal wall which in some instances permitted a herniation of the loop; or allowed the loop to retract or pull inward toward the abdominal cavity.

In many of the operations for excision of the rectum, a segment of the sigmoid is left between the colostomy and the site where the bowel is cut off in making the excision of the rectum. In such instances, if the co-

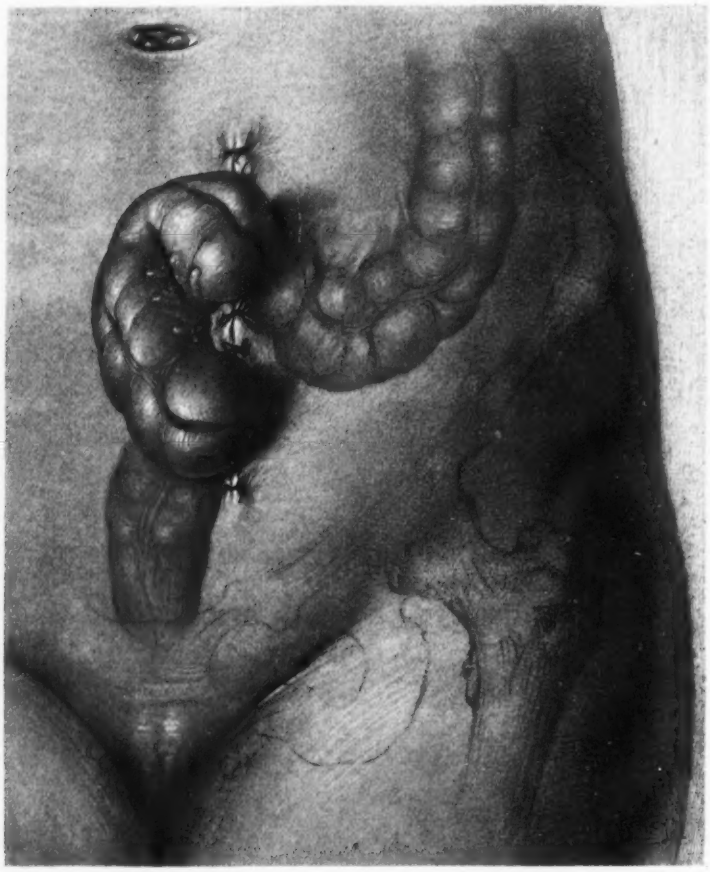

Fig. 3. Unopened loop of bowel brought out for colostomy after the abdominal incision has been completely closed.

lostomy retracts sufficiently to permit the distal end to empty its contents into the segment, the fæces gradually accumulate and produce a large painful tumor. Occasionally we have found it necessary, either to remove this segment or to empty it and perform a plastic operation which will more widely separate the ends of bowel.

We are now making a colostomy very similar in type to the one described by Mixter. As a rule this colostomy is made through a straight incision placed below and about one inch to the left of the umbilicus.

An incision of this type possesses distinct advantages. Through it a thorough exploration of the abdominal cavity may be made. If it is found necessary, a primary resection of the bowel is possible, or, the first stage of the three-stage Mikulicz operation can be done. The incision may be extended in either direction, and if, after the exploration, it is decided to make a colostomy, this is made through the center or upper end of the incision.

OPERATION

The colostomy is made in a loop of the sigmoid flexure; this portion of the bowel is chosen because of its extreme mobility and

the length of its mesentery. After the loop has been lifted out of the abdominal cavity, an incision from one and one-half to two inches in length is made through its mesentery, parallel to the direction of the blood-vessels, and extending upward nearly to the bowel. A second incision, about one inch long, is then made across the end of the first incision quite near the mesenteric attachment of the bowel. Two strips of gauze are placed in the upper end of this T incision and when these are pulled apart a good sized opening through the mesentery is created. The two sides of the entire abdominal wall near the center of the abdominal incision are sutured through this opening in the mesentery. The remaining portions of the incision are then closed; a small bite of the bowel is included in two of the sutures to prevent the possibility of herniation of a loop of small intestine. When the gauze has been removed a glass rod or rubber tube is placed through the opening in the mesentery between the skin and bowel to serve later as a guide in cutting across the bowel (Figs. 1, 2, 3, and 4).

If necessary for gas distention, a small opening may be made in the bowel any time after twenty-four to forty-eight hours, and in from five to six days the bowel is cut across completely with the cautery. As a rule, however, the patients pass gases very readily through the knuckle which has been brought up, and it is unnecessary to disturb it before five or six days. After the loop has been cut across it will be found that the two ends of bowel are separated by the entire abdominal wall for a distance of from one to one and one-half inches and that the cut ends of bowel protrude for a distance of an inch or two above the skin. These may later be cut shorter if thought necessary.

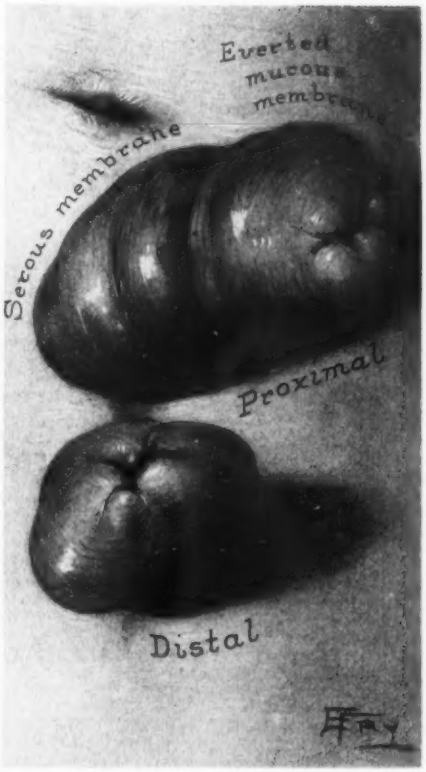

Fig. 4. Ends of the bowel after it has been completely cut across.

The advantages of an operation of this type can be readily seen. In our hands it has obviated some of the difficulties which have often followed other types of colostomies.

THE TREATMENT OF HODGKIN'S DISEASE[1]

By CURTIS F. BURNAM, M.D., F.A.C.S., Baltimore

FEW morbid processes present greater variations in rate of progress and more protean clinical manifestations than does Hodgkin's disease. Its course may be run in a few weeks or extend over years. Tumefaction may be pronounced and the constitutional disturbance slight; but often the exact reverse is true. The primary lesion may appear in the neck, in the mediastinum, in the abdomen or in all these places simultaneously. The patient may come to us for help for pruritus with or without skin rash, for a chronic cough or dyspnœa, for œdema of the leg, or for an invasive breast growth. Periods of quiescence and rapid progress alternate in some cases; in others there is a steady march of the disease. Without treatment all recorded cases have ended in death. There is no authentic report of a spontaneous cure, although it is quite possible that such do occur.

Over a period of six years I have treated more than a hundred cases of Hodgkin's disease and malignant lymphoma or lymphosarcoma, which resembles it so closely clinically. I have in preparation a detailed case and statistical report of this series. I shall not, however, describe individual cases in this paper nor give a critical review of the very valuable studies in recent literature, although such a review is almost indispensable to an adequate presentation of the progress being made in the knowledge of the etiology, pathology, and treatment o' the disease. I mus confine myself to a few practical conclusions drawn from my own experiences.

DIAGNOSIS

Exact diagnosis is necessary as a prel'minary to adequate treatment, and such diagnosis rests on X-ray, blood and tissue examinations as well as on a careful general physical examination.

In the advanced stages, tissue examination is the most reliable single criterion. By this

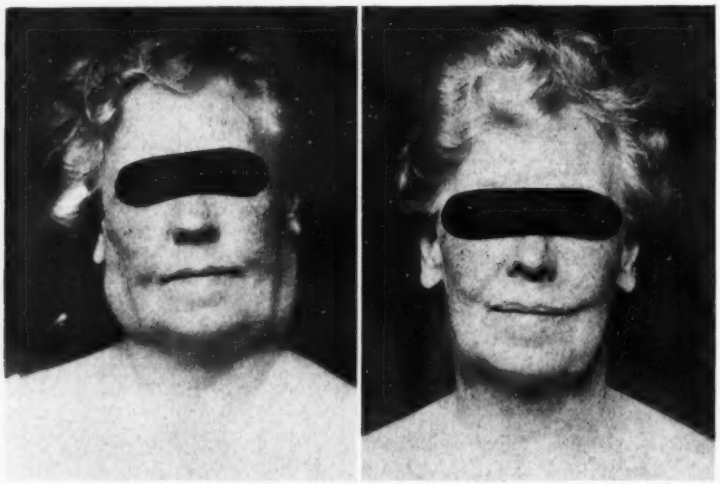

Fig. 1a (at left). Miss K. A. D. (1897). Hodgkin's disease with general involvement and marked pruritus. Photograph taken September 8, 1915, before treatment.

Fig. 1b. Miss K. A. D. (1897). Photograph taken October 11, 1915, after three radium treatments. Complete disappearance of all evidence of trouble. Well at present. Cure has lasted more than three years.

[1] Presented before the Southern Surgical Association, Baltimore, December 18, 1918.

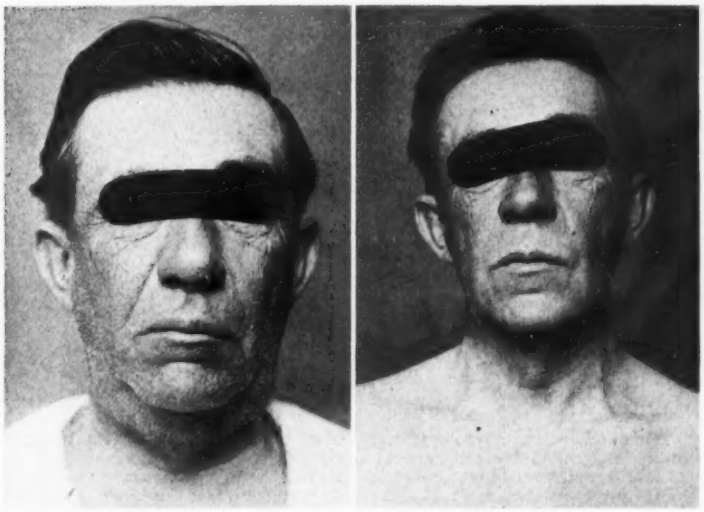

Fig. 2a (at left). Mr. F. G. (2399). Hodgkin's disease. No tissue. Blood not characteristic. Photograph taken April 6, 1916, before treatment.

Fig. 2b. Mr. F. G. (2399). Photograph taken April 17, 1917, after five treatments. No treatments since. At present no evidence of trouble. Well for nearly three years.

Fig. 3a (at left). Miss D. E. (2290). Chronic Hodgkin's disease with extensive involvement of skin and clavicle, and infiltration of breast. Photograph taken February 23, 1916, before treatment.

Fig. 3b. Miss D. E. (2290). Photograph taken October 17, 1916, after ten exposures to radium. Still under treatment. At present her arm is greatly swollen but her general health is good.

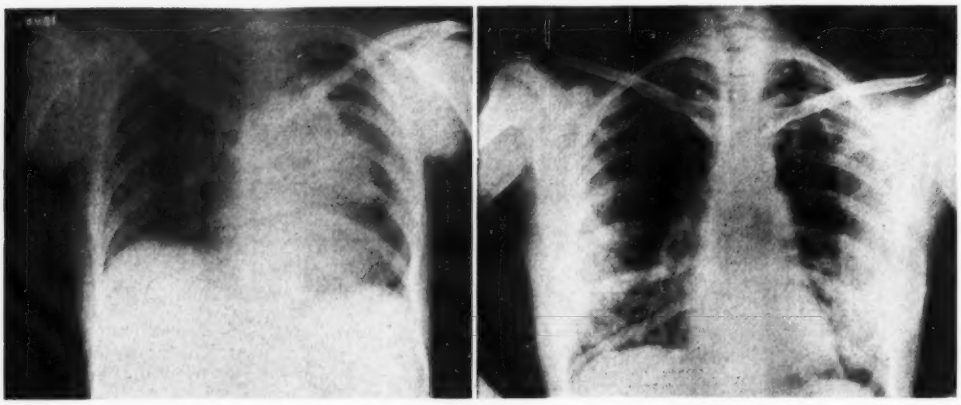

Fig. 4a (at left). Mrs. R. L. (126). Lymphosarcoma of mediastinum and neck. Diagnosis from tissue. Roentgenogram taken June 14, 1913, before treatment.

Fig. 4b. Mrs. R. L. (126). Roentgenogram taken May 4, 1917, after eight treatments. After three treatments the chest was negative. In the spring of 1917, a recurrence appeared which was dissipated by further treatment. Perfectly well ever since.

method, the typical Dorothy Reed Hodgkin's disease, lymphosarcoma, tuberculosis, syphilis, and the metastatic tumors are readily separable. In very early lesions, it may be impossible to distinguish between lymphosarcoma, Hodgkin's disease, simple hyperplasia and tuberculosis, as they all have more or less the microscopical characteristics of lymphosarcoma.

As a routine diagnostic measure, I advocate the removal of at least two isolated glands. I have seen no spread of the disease as a consequence of this procedure. On the contrary, attempted removal of large masses, as in block dissection of the neck, frequently aggravates the disease.

As to whether there is a common etiologic cause of Hodgkin's disease and lymphosarcoma, I am unprepared to express an opinion, but until such relationship is shown to exist I feel that they should be considered as separate diseases.

Blood examinations are relatively much less valuable than tissue examinations. A positive finding of Bunting's blood picture does not necessarily mean that the patient has Hodgkin's disease, nor does a negative finding show the absence of such disease. For, out of 34 cases where the tissue showed positive Hodgkin's disease, the blood was positive in only 21 instances and was negative in 13. Moreover, out of 26 cases where the tissue showed positive lymphosarcoma, 3 cases showed the blood which Bunting has designated as characteristic of Hodgkin's disease.

X-ray examinations are indispensable in determining mediastinal and chest involvement. They frequently prove the presence of marked trouble, when neither the history nor ordinary physical examination suggests it.

TREATMENT

The medicinal treatment of Hodgkin's disease is most unsatisfactory. A few apparent cures from salvarsan and other forms of arsenic are on record. My impression is that when arsenic is forced it tends usually to make the disease progress more rapidly.

Vaccines made from the diptheroid organism have been extensively used but with indifferent results. I have had no personal experience with them.

Under the influence of the splendid work of Bunting and Yates, there has been a marked revival in favor of surgical removal of Hodgkin's glands — a procedure which had been well nigh abandoned because of the impression that it was not only useless but harmful. There can be no question, however,

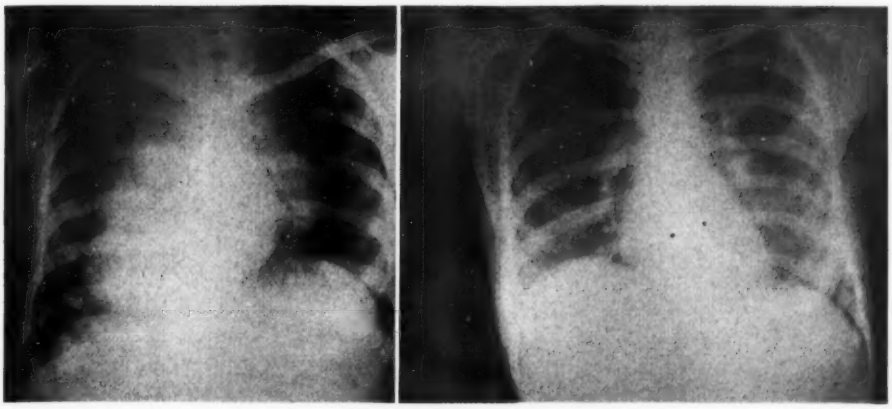

Fig. 5a (at left). R. F. (2471). Acute Hodgkin's disease. Patient was extremely ill with huge masses in neck, chest, and abdomen. There was high fever and marked emaciation. Roentgenogram taken April 7, 1916, shows chest condition before treatment.

Fig. 5b. Miss R. F. (2471). Roentgenogram taken March 15, 1918, shows improved condition two years later after a series of radium treatments. General condition at present satisfactory, although there was a recurrence in one and one-half years. Still under treatment.

that their more satisfactory experiences are due to the invariable and immediate employment of X-ray treatment in conjunction with the operative removals.

X-ray therapy in Hodgkin's disease is not new. It has been widely practiced ever since Nicholas Senn's report now nearly twenty years ago. That the X-ray has a very beneficial effect both in ameliorating constitutional symptoms and in reducing tumor there can be no question. Nevertheless, few if any, authentic cures by this method are on record.

While many of our patients had been treated both operatively and with X-ray, I have made use only of radium, combining it in some cases with rest in bed, forced feeding and iron in the form of Blaud's pills.

Most of the patients were in advanced stages of the disease. Many of them were acute cases, some of them practically in articulo mortis.

I have excluded from consideration only those cases in which the disease was limited to the tonsil, where it is difficult to classify as Hodgkin's, lymphosarcoma or hyperplasia. Most satisfactory results have been obtained in this group, which doubtless contains instances of Hodgkin's disease.

In general I find that better results are obtained in cases where the tissue examination shows lymphosarcoma than where it shows Hodgkin's disease, and in Hodgkin's disease where the characteristic polymorphonuclear leucocytosis is not present.

Chronic cases are more favorable than acute. Intensive prolonged exposures, very satisfactory in some chronic cases, are quite unsuitable in acute cases.

In a chronic case limited to one set of glands a single exposure may lead to a cure, which has, in one case, extended over five years. Heavy exposures in acute Hodgkin's disease are usually followed by rapid reduction in the size of the gland masses but with no corresponding improvement in the blood or the patient's general condition. In these acute cases rest in bed, forced feeding and mild fractional radiation are indicated. This method of treatment we have used for only about one and one-half years, and are consequently unable to report on the results. Acute cases treated more than one and one-half years ago with the heavy dose method are dead with the exception of Miss R. F., aged 18. This girl was admitted to the hospital on April 6, 1916, with high fever, a great mass in the abdomen, and another in the chest; she was extremely emaciated and evidently dying. Under treatment there was apparent complete cure lasting for more than

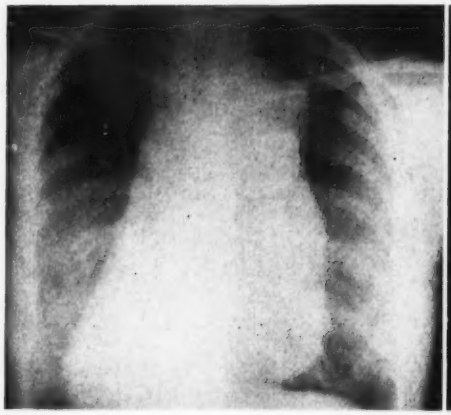

Fig. 6a (at left). Miss L. L. (3971). Mediastinal tumor with tissue and blood both characteristic of Hodgkin's disease. Roentgenogram taken May 23, 1918, before treatment.

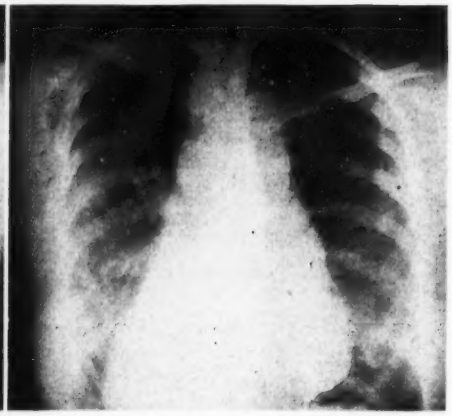

Fig. 6b. Miss L. L. (3971). Roentgenogram taken October 18, 1918, after four radium treatments. It was impossible to give heavy dosage in this case, so frequent, light treatments were used. Still being treated.

one and one-half years. There was then an extensive abdominal recurrence which is at the present time yielding to treatment.

Rest and abundant feeding are of great importance in the chronic cases. Heavy work and exposure readily lead to relapse.

The most unsatisfactory chronic cases are those with very little glandular enlargement but with marked constitutional symptoms and changes in the blood. In two or three cases of this kind met with there has been but little amelioration of the patient's condition following treatment.

In every case where the infection is limited to isolated groups of glands, such as one side of the neck and axilla, a complete disappearance of the glands can be looked for with confidence. Where the disease is extensive, especially in mediastinal cases, this is more uncertain.

In chronic Hodgkin's disease the disappearance of the gland masses is almost invariably accompanied by improvement in general health, gain in weight, disappearance of pruritus and the return of the blood to a normal appearance.

TECHNIQUE

Treatment must be so planned that adequate radiation will be applied to all parts of the body affected by the disease. At the same time great care must be taken to avoid injury of normal structures, particularly the skin. It is probably desirable even in early localized cases to radiate all the regions of the body in which Hodgkin's disease is likely to appear. There is apparently no effect on gland masses when not directly radiated.

The guide to treatment is to be found in the effect on the gland masses, the blood, the appetite and the general health of the individual case. No fixed plan of treatment is possible as a routine measure. The dose that is effectual in causing gland disappearance in one case may be many times greater than that required in another case. One patient may suffer with loss of appetite, fever, and general malaise from a treatment which when given another causes none of these disturbances. I should say that several hundred milligrams is a workable minimum for use in the treatment of Hodgkin's disease. In a few cases we have used as high as fifty gram hours in a single dose.

Gamma radiation from radium placed at a distance from the surface varying from one and one-half to five inches, has been used — the length of the exposure being inversely proportional to the amount of radium employed.

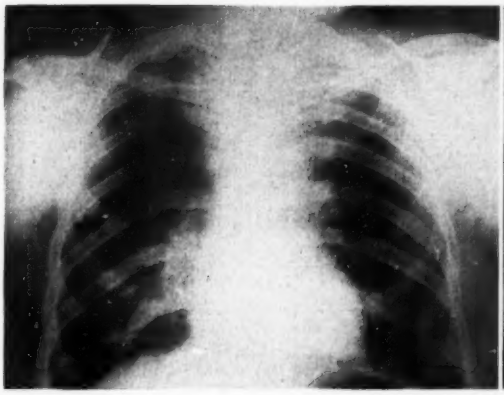

Fig. 7a. Mr. C. S. B. (2255). Hodgkin's disease with cervical, mediastinal, and axillary involvement. Tissue and blood both characteristic. Roentgenogram taken February 7, 1916, before treatment.

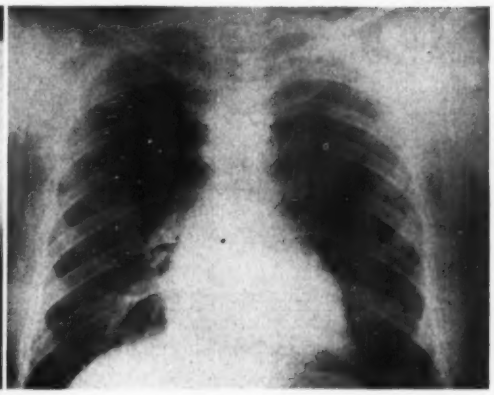

Fig. 7b. Mr. C. S. B. (2255). Roentgenogram taken March 6, 1917, after three treatments. Patient has been well for nearly three years.

GENERAL RESULTS

The reduction of gland masses, amelioration of discomforts and improvement in general health already referred to occur in most cases and sometimes are most striking in the very advanced stages. It seems to me that we may confidently look for permanent cure in an increased proportion of these patients with further improvement in our methods of treatment. It is, of course, impossible to fix any definite time limit as an indication that the disease will not recur. I recently had the experience of an extensive abdominal recurrence and death in a patient apparently well for four years from a pharyngeal and neck lymphosarcoma.

Excluding all patients where apparent cure has been less than three years, we have had, where lymphosarcoma was diagnosed, 2 cases perfectly well and without signs of trouble for more than five years; one an extensive neck case, and one an abdominal case. Four cases have been apparently well for over three years; 1 with pharyngeal and neck involvement, 1 with mediastinal, 1 with tonsil, neck and groin, and 1 case with neck and axilla involvement.

Excluding all patients where apparent cure has been less than three years, we have had, where Hodgkin's disease was diagnosed, 1 patient with mediastinal and neck involvement well for four years, and 2 cases well for more than three years. One of these had neck, axilla, groin and iliac glands; the other groin, axillary, neck and mediastinal involvement.

While there is no objection to the complete surgical removal of a localized group of glands, if it is followed by radiation, it does not seem to me that this is necessary.

ECTOPIC OR PELVIC KIDNEY[1]

By E. S. JUDD, M.D., and S. W. HARRINGTON, M.D., Rochester, Minnesota
From the Mayo Clinic

RENAL ectopia, or congenital misplacement of the kidney, is a condition in which the kidney has never occupied its normal position; it is to be distinguished from the movable kidney which has wandered from its normal position. Renal ectopia is due to developmental defects of the renal anlage. The renal buds appear on the dorsal aspect of the wolffian duct, shortly after it has reached the cloaca, as a thickening and bulging of the wall which soon develops into a narrow stalk capped with a mass of mesoblastic tissue, designed to be the future kidney. These buds grow dorsally during their process of development, in ascent from in front of the second sacral vertebra, rotate to a lateral position on either side of the vertebral column, and reach their normal position in the lumbar region about the end of the second month. It is not until after they have reached this position that they receive vascularization. This process of ascent and rotation may stop at any point during its course or it may not be instituted at all; thus the kidney never reaches its normal height and becomes permanently fixed in an abnormal location. Variations in size and form often follow from its adaptation to its surroundings, and are governed to some extent by environment and developmental defects. Often there is an associated defective development of mueller's duct, which does not normally develop until after the primitive kidney has reached its final height, which accounts for the frequent association of genital malformations with ectopic kidney.

Renal malposition is comparatively rare but occurs often enough to interest diagnosticians, and a sufficient number of such cases develop pathologic conditions requiring surgical intervention, to interest the surgeon. The condition has been recognized for centuries, and was well known to the early writers of the sixteenth century, but it was then of anatomic interest only. Cases were reported by Bauhinus and many others. The

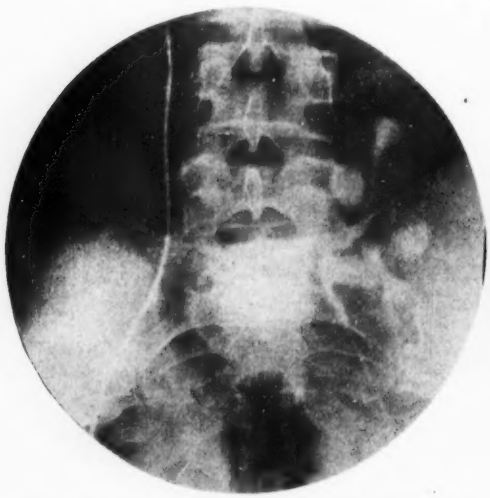

Fig. 1 (154170). Left ectopic kidney; moderate clubbing and dilatation of calyces. Lead catheter in the right ureter showing the right kidney in normal position.

Fig. 2 (229728). Solitary right ectopic kidney. Pelvis small and irregular in shape situated opposite middle of sacrum. Ureter short and tortuous.

[1] Presented before the Southern Surgical Association, Baltimore, December, 1918.

Fig. 3 (225346). Pelvic outline extending below the crest of the ilium. Right ectopic kidney.

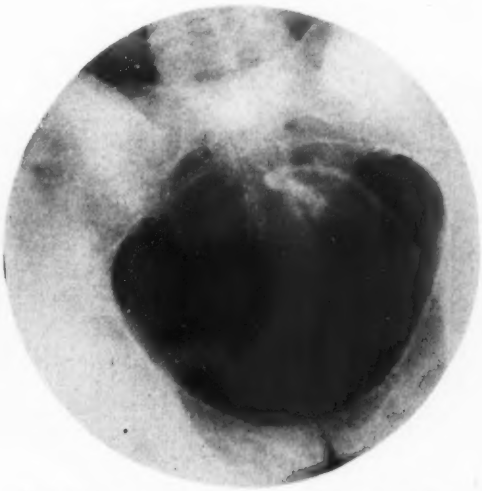

Fig. 4 (17834). Left ectopic kidney obstruction to left ureter just outside the bladder.

frequency of the occurrence of misplaced kidney has been variously stated by different authorities: Naumann, in 1897, reported 21 cases in 10,177 necropsies at the Kiel pathologic institute. Gerard, in 1903, estimated its occurrence as 1 in 2,500. Guizzetti and Pariset, in 1910, reported 18 cases in 20,000 necropsies. Within the last two decades the condition has become of surgical interest, and with the accurate means of diagnosis now used is steadily growing in clinical importance. Dorland, in 1911, collected 121 clinical cases from the literature, about 100 of which had been published since 1898. In less than one-third of them the symptoms were due to displacement or disease in the ectopic kidney. Plummer, in 1913, reported 67 cases, collected by Strater in 1906, to which he added 17, making a total of 84 clinical cases. Operations were done in 63 of Strater's 67 cases; 48 were some type of operation on the kidney.

Our series comprises 19 cases of ectopic kidney which have been selected from the records of the clinic. In 9 of these, operations were done because of pathologic conditions in the misplaced kidney. In the remaining 10 cases the condition was discovered either during the course of some other operation or in making a routine examination of the kidney. In these 10 cases the kidney, while misplaced, was not producing any symptoms and apparently was functionating normally.

ANATOMIC FEATURES

The ectopic kidney shows some distinct anatomic features, mostly in its blood supply.

Fig. 5 (184087). Left ectopic kidney with moderate hydronephrosis.

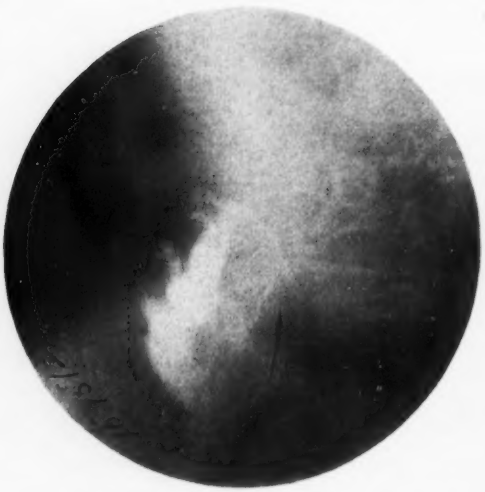

Fig. 6 (151512). Right ectopic kidney with hydronephrosis.

Fig. 7 (120522). Right ectopic kidney with reduplication of pelvis.

It is usually approximately normal in size when not diseased, although it may be smaller than normal. It may be oval or pyramidal in contour, depending somewhat on the surrounding structures, and it may retain its fœtal lobulations. The origin of the blood-vessels supplying the misplaced kidney is always lower than normal. The arterial supply is very liberal; as many as six vessels entering the kidney have been reported. These vessels may come from the lower few inches of the aorta, from a branch of the aorta, or from both. The usual origin is the lower few inches of the aorta, especially at the bifurcation, but it may be the common iliac, the midsacral or inferior mesenteric. As a rule the veins correspond to the arterial supply, but an anomalous arrangement is frequently found. The ureter is generally shorter than normal; usually takes a short tortuous course to the bladder and enters it in the normal position. The pelvis of the kidney and the ureter are usually on the anterior side of the kidney, and in this manner they retain their fœtal relation. The pelvis is not always fully developed. The position that such a kidney assumes varies greatly depending on the time at which the normal process of development ceases. Its most frequent location is entirely within the small pelvis behind the uterus, to one side, or resting on the promontory of the sacrum or sacro-iliac joint. It is sometimes located in the iliac fossa, and rarely in the abdominal wall. It is usually firmly fixed in the position assumed, due chiefly to its vascular pedicle. It may become

Fig. 8 (212352). Left ectopic kidney with pyonephrosis and stones.

movable from trauma or pregnancy. A pelvic kidney is much more frequently found on the left side than on the right, and it is usually on the side where it normally belongs, although crossed ectopic kidneys are quite often seen. Occasionally both kidneys are in the pelvis, and rarely an ectopic supernumerary kidney may be found. The adrenal glands develop independently; they are always found in their normal position and never accompany the ectopic kidney. It is interesting to note the frequency with which genital malformations of both sexes are associated with dystopia of the kidney, particularly in cases of single pelvic kidney. The genital defect, if unilateral, is found on the same side as the ectopic kidney. The more frequent defects are the imperfect development or the entire absence of the uterus and the vagina. There may be an absence of vulvar and urethral openings, and atrophic and undescended testicle is often seen. In quite a number of the reported cases there has also been an imperfect development of the urinary bladder. Definite mental disturbances have been observed to be associated with ectopic kidney, and are believed to be the stigmas of degeneration, due to developmental defects. Ectopic kidneys are usually normal and although they are subject to all the pathologic conditions to which a normal kidney is subject, they are only discovered by chance during an examination, or at necropsy. When any lesion exists in the kidney, there seems to be a tendency for it to become hydronephrotic, probably because of the short ureter and poorly formed pelvis and ureter. The surrounding structures may also play a part in this condition. Stones are frequently found in these kidneys, as is also cystic degeneration and tuberculosis.

CLINICAL FEATURES

From clinical observations it appears that pelvic kidney occurs more often in females than in males, but at necropsy, it is found as often in the male. This is undoubtedly owing to the fact that the misplaced kidney in the female is more prone to cause symptoms which simulate disease of the uterus and adnexa, and also menstrual disturbances. When the ectopic kidney is pathologic the symptoms are the same as when the condition is present in a normally placed kidney. The diagnosis depends on the physical findings, the X-ray and the kidney examinations. The diagnosis, ordinarily, is not easily made, but there are some physical findings which are of aid. The palpation of a tumor through the abdominal wall or rectum especially with the absence of the kidney from its normal position, is suggestive of the condition. The absolute and relative fixation of the tumor and often the palpation of the lobulations of a kidney, the depression in the hilus, and at times the pulsation of a large artery on its anterior wall, may be noted. The presence of genital malformation associated with a pelvic tumor should lead one to suspect ectopic kidney. Cystoscopic examination and pyelography give the most accurate data, and it is on these data that a definite diagnosis is made. Frequently the cystoscope reveals certain fairly characteristic features, especially the pulsation in the trigone from an underlying large renal artery. The ureteral meatuses are usually normal but the ureter from the ectopic kidney is much shorter and may be coiled and distorted. The pyelogram shows the abnormal position of the pelvis and makes it possible to determine whether or not the kidney is pathologic. The presence of stones also is shown.

The differential diagnosis is more difficult in the female than in the male because of the frequency with which the ectopic kidney causes symptoms referable to the adnexa. In many instances a pelvic kidney has been called an ovarian cyst and explorations have been made with the idea that the condition is a cyst in one of the ovaries. A pyonephrosis in an ectopic kidney has been mistaken for pyosalpinx. The most common error in diagnosis in the male has been in differentiating between the dystopic kidney and inflammation in the appendix. In two of our cases it was quite difficult to determine whether the symptoms were being produced by the appendix which showed a slight degree of inflammation or whether the symptoms were produced by some infection which was located in the pelvic kidney.

TREATMENT

From a surgical point of view the treatment of ectopic kidney differs in no essential from the treatment when the organ is in its normal position. The mere fact that the kidney did not rise to its normal position does not indicate that it requires treatment. If the kidney is functionating normally in its malposition, under ordinary circumstances it should not be disturbed. A few instances have been reported in which a kidney in the pelvis was interfering with pregnancy, and apparently was the cause of repeated miscarriages. In such cases it might be advisable to attempt to raise the kidney to a higher position. Ordinarily, it is difficult to change the position of the ectopic kidney because the blood-vessels in the pedicle are short and the kidney is rather firmly fixed. In some cases, however, in which the kidney is producing symptoms such as would be caused by an intermittent hydronephrosis, although the function may be normal, it would seem advisable to attempt to change its position, and possibly to do a plastic operation at the point of obstruction. This was done in one of our cases, and quite a satisfactory result was obtained. In some of the reported cases in which a nephrorrhaphy had been done, it was necessary subsequently to remove the kidney.

The problems presented by the ectopic kidney during pregnancy and parturition are often difficult to decide, but fortunately most deliveries are accomplished without surgical intervention. We have not observed a case of pregnancy complicated in this manner, but from reported cases it would seem that the amount of hindrance to labor depends on the amount of narrowing of the true pelvis, and also on the degree of fixation of the kidney. It has been suggested that if the condition is noted early in the pregnancy and if it seems to narrow the pelvic inlet sufficiently to hamper labor, an attempt should be made to anchor the kidney above the brim of the pelvis. It has also been suggested that a nephrectomy should be done under such conditions, but we believe that instead of doing a nephrectomy which might be quite a serious procedure, it would be best to wait until during the last stages of pregnancy, and then perform a cæsarean section.

The surgical treatment of pathologic conditions in the ectopic kidney is practically the same as for like conditions in normally placed organs. In all cases in which there is destruction of kidney tissues, impaired function, and a normal kidney on the opposite side, a nephrectomy is certainly indicated. Before considering nephrectomy in such cases, however, it is very important to determine the condition of the opposite kidney. In three of our cases, the ectopic kidney was solitary, and in all it seemed to be the cause of the symptoms.

REVIEW OF 19 CASES

Nine of the nineteen cases of ectopic kidney of this series were operated on for some pathologic condition in the kidney.

In one case an exploration was made to determine the nature of a pelvic tumor which proved to be a fairly good kidney, lying within the pelvis. It was freed from its pelvic attachment and a fixation was made as high up as possible. This seemed to relieve the patient for some time but she returned in fourteen months with symptoms somewhat the same.

In the second case, a diagnosis of a functionless right kidney with hydronephrosis and tumor was made. An exploration revealed an ectopic kidney. Nephrectomy was done with satisfactory recovery.

In the third case, the patient gave a history of gall-bladder trouble. Physical examination revealed a rather firm mass in the right abdomen, and exploration showed the mass to be an ectopic kidney, which was freed and fixed in a higher position. The condition of the gall-bladder was remedied at the same time. This patient's convalescence was uneventful.

In the fourth case, the patient complained chiefly of female trouble, namely, attacks of pelvic pain on either side which required rest in bed for several days at a time. Examination showed a small mass in the left iliac fossa, and a deformity of the vagina and uterus. At operation a pyonephrotic left kidney was found. The ureter was about three inches long and there were three renal arteries, all coming from the common iliac. The kidney was removed. Convalescence was satisfactory except for a phlebitis in one of the saphenous veins.

In the fifth case, the complaint was kidney trouble. Bacilli of tuberculosis had previously been found in the urine and a diagnosis of tuberculosis of the right kidney was made. At operation the kidney was definitely tuberculous, and was situated in the right iliac fossa. The blood supply came from three large vessels from the lower aorta.

In the sixth case, the complaint was of frequent and painful micturition, and a cystocele. The cystosopic examination showed a pyonephrosis on

the right side. The combined functional test was only 35 per cent in two hours. At operation a small kidney was found lying in the pelvis, with a hydronephrosis and some infection. The ureteropelvic juncture was a definite stricture which was incised and a plastic operation done. The convalescence was satisfactory.

In the seventh case, the chief complaint was left lower abdominal pain. The physical examination was negative, with the exception of tenderness in this region. Obstruction was encountered 10 centimeters up the left ureter and a pyelogram showed that the left kidney was lying in the pelvis, and that the pelvis of the kidney and the calyces were dilated. The arterial and venous blood supply was characteristic of an ectopic kidney. A nephrectomy was done and the patient made a good recovery.

In the eighth case, the patient complained of a combined urinary and fæcal fistula in the left inguinal region. The fistula had persisted since an operation for the drainage of a large abscess in this region some weeks previously. Soon after drainage was established, stones, urine, and fæces began to discharge. Examination revealed an obstruction of the ureter, and X-ray examination showed multiple stones in the pelvis and calyces of a pelvic kidney. Two subcapsular operations were performed; the infected kidney tissues and a large number of stones were removed.

In the ninth case the patient had complained of pain through the pelvis and a left hydronephrotic pelvic kidney was discovered during an exploration. The diseased kidney was removed, and the patient made a good recovery.

In one case an exploration was made which revealed an absence of the right kidney and a congenital malformation of the liver and duodenum. The left kidney was large and was situated in the region of the sacro-iliac joint. Fortunately, the absence of the opposite kidney was discovered before anything had been done to the pelvic kidney.

In four of the series the condition of congenital misplacement of the kidney was discovered during the course of some other operation, and in most instances the position and condition of the kidney probably had nothing to do with the production of the patient's symptoms. In two cases, the kidneys were discovered while an operation was being performed for appendicitis, and in both instances the appendix showed definite inflammation. In view of the fact that the symptoms subsided after the appendix had been removed, the position of the kidney apparently had nothing to do with the symptoms. One of these patients, a young married woman, came for consultation because of repeated miscarriages. The pelvic kidney was thought at first to be an ovarian cyst, but on exploration it was found to be a kidney apparently in good condition. The uterus was lifted up in the pelvis by shortening the ligaments; nothing was done with the kidney. I was unable to get a late report in this case, so do not know whether the condition was remedied. In one case, the pelvic kidney was discovered while an operation was being done for congenital absence of the vagina.

In five cases of the series the malposition of the kidney was discovered in a routine examination by means of a pyelogram. In all of the five cases, the kidney was apparently normal with the exception of its position. In two instances the pelvic kidney was found to be a solitary kidney. In one there was lack of development in other regions, and in one there was a reduplication of the pelvis (Figs. 1–8).

SUMMARY

In conclusion it may be stated that this particular malposition of the kidney occurs rarely. The kidney may functionate in a perfectly normal manner in this position and it may never be discovered or if discovered it will not require treatment. The condition is of interest when the kidney becomes involved in some pathologic process such as hydronephrosis, pyonephrosis, or tuberculosis. Under these conditions the location of the kidney may be misleading in the diagnosis, which, however, can accurately be made by a careful examination of the bladder, meatus, and kidney by means of the cystoscope, the ureteral catheter, and the pyelogram. After the diagnosis has been established, the treatment is the same as for a pathologic condition of a kidney in its normal location.

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OPERATIVE TREATMENT OF UNDESCENDED OR MAL-DESCENDED TESTIS WITH ESPECIAL REFERENCE TO END-RESULTS

A Report of 415 Cases[1]

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Attending Surgeon to the Memorial Hospital and the Hospital for Ruptured and Crippled

IN the Out-patient Department of the Hospital for Ruptured and Crippled, from 1890 to 1918, there have been observed 80,736 cases of inguinal hernia in the male, of which 1,357 or 1.68 per cent were associated with undescended or mal-descended testis. From 1890 to 1918, 4,453 cases of inguinal hernia in the male have been operated upon, of which number 334 or 7.5 per cent were associated with undescended testis.

Of 1,040 cases of hernia in adults operated upon at the Memorial Hospital by Dr. William A. Downes and the writer, 49 or 4.71 per cent were associated with undescended testis.

In a paper read before the New York Surgical Society on April 22, 1908, I reported 126 cases of undescended testis which I personally operated upon, and which had been traced as far as possible to end-results.

While a number of articles have been written upon the subject since that date, there is still more or less doubt in the mind of the medical profession as to the indications for surgical treatment and still a wide difference of opinion as to the best method of operation. Even at the present time, no large statistics exist in which the end-results of operative treatment have been given, and the present paper has been written chiefly with the hope that some further light may be thrown upon the question as to the condition of patients with undescended testis many years after operation.

In my earlier paper I dwelt with considerable detail upon the various theories as to the causative factors connected with the development of the undescended or mal-descended testis, and described the various types of undescended or mal-descended testis usually observed.

As regards the etiology of the condition, the theory that a mechanical obstruction of some sort due to inflammation, adhesions formed during fœtal life is the principal cause, has been strongly advocated by Buedinger and has found many adherents. Buedinger operated upon 24 cases of undescended testis of the inguinal variety, and states that he found mechanical obstruction of some sort in 15 of these 24 cases.

As I stated in my former paper, Odiorne and Simmons, of Boston, have made an important contribution to our knowledge of the pathology of the undescended testis in their paper published in the *Annals of Surgery*, December, 1904. They found a marked tendency to thickening of the tunica albuginea in nearly all of the specimens examined and an increased amount of interlobular connective tissue.

More recently, Uffreduzzi,[2] of Carle's Clinic in Turin, has made perhaps the most exhaustive study of the pathology of the retained testicle that has yet been published.

His observations upon the etiology of the undescended testis are of special interest. He states that the explanations offered by many of the earlier writers are exceedingly naive, in that these writers frequently confound the cause of the anomaly with its result. Kocher explained the incomplete descent of the testis as well as the atrophy of the gland by an inflammatory process during intrauterine life, but was unable to support his hypothesis by objective findings. The theory that the non-descent of the testis is dependent upon mechanical obstruction due to peritoneal adhesions occurring during fœtal life, was originally advanced by Cloquet and Wrisberg, and later strongly advocated by Buedinger and supported, he believed, by numerous necroscopic and operative findings. Buedinger goes so far as to state that in his opinion mechanical obstruction caused by such ad-

[2] Arch. f. klin. Chir., c, No. 4, and ci, No. 1.

[1] Read before the Southern Surgical Association, Baltimore, December 17–19, 1918.

hesions accounts for retention of the testicle in 96 to 97 per cent of the cases and that the instances in which a congenital origin of retention is apparent, will amount to not more than 2 to 3 per cent.

Uffreduzzi disagrees entirely with Buedinger's conclusion, and in regard to the great frequency of such cicatrices, he states that no other investigator has found them in any such proportion as Buedinger. Lanz stated that he found no such cicatrices in any of his 51 cases, nor did Uffreduzzi himself observe a single such case.

My own observations based upon our experience at the Hospital for Ruptured and Crippled, and other hospitals, are in accord with Uffreduzzi. I have found no evidence of old adhesions. Uffreduzzi lays far more stress upon the element of heredity as a cause of ectopia, a theory first advanced in the classical paper of Godard's. The latter states that the descent of the testicle as it takes place in man is nothing but an example of the phylogenetic migration as it gradually takes place in zoological evolution. Hence, some authors consider retention of the testicle a simple continuation of a condition that is normal in certain animals, and that a retained testicle must be looked upon as a sign of arrested development.

I have personally operated upon a boy of thirteen years with double abdominal ectopia, who has a younger brother of 12, also with abdominal ectopia.

Uffreduzzi states that in the great majority of cases of ectopic testicle there are other signs of degeneration. In 24 cases examined by himself, he invariably found a greater or less number of distinct anomalies, physical as well as mental. In one case bilateral cryptorchism was associated with true hermaphroditism. This extremely rare form of hermaphroditism, of which only two other cases are recorded in the literature, represents one of the most serious forms of degeneracy known.

On basis of his investigations, Uffreduzzi concludes that retention of the testicle is hardly ever an isolated fact, but merely a local expression of infantilism, i.e., of a serious retardation in the development of the entire individual, which may be more or less pronounced and is nearly always accompanied by other bodily or mental abnormalities.

Uffreduzzi has made an exhaustive study of the literature with reference to developmental anomalies of this kind in idiots and mentions Bournville and Sollier's statistic, comprising 758 cases of idiots which show such anomalies as phimosis, hypospadias, atrophy, retention of the testicle, various malformation of the penis, in a considerable number of cases.

Kneckt's statistic, covering 379 individuals belonging to this group, shows: phimosis 51 times; bilateral retention of testicle 11 times; atrophy of the testicle 18 times; epispadias twice, hypospadias 5 times; varicocele 12 times.

Uffreduzzi's own examinations made at Morro's Institute for Insane, covering 100 cases, show 47 simple epileptics; 7 epileptic idiots; 12 cretins; 14 phrenosthenics. In 18 of these 100 cases he found an ectopic testicle (6 bilateral and 12 unilateral).

Personally I believe that Uffreduzzi goes somewhat too far in his claim that in the great majority of cases of ectopic testicle there are other signs of degeneration. I believe a study of the statistics will show that while these various types of abnormal mental development have associated with them a large proportion of undescended or mal-descended testis, it does not necessarily follow that the reverse is true. Such a statement as Uffreduzzi's should be based upon evidence obtained from a very large number of cases of undescended testis. Our own observations at the Hospital for Ruptured and Crippled based upon 1,357 cases of undescended testis show that marked signs of physical or mental abnormalities are only associated with double undescended testis, and in but a moderate proportion of these. As regards the unilateral, undescended or mal-descended testis we have found no evidence showing that this is usually or frequently associated with other abnormalities.

As regards the pathology of the undescended testis, owing to the fact that we have from the beginning, strongly advocated attempting to save the undescended testicle and not to sacrifice it, we have had very little material

for pathological investigation. Uffreduzzi states that the structure of the retained testicle varies greatly in the individual cases. The principal changes that are nearly always found are thickening of the tunica albuginea, and of the basement membrane of the tubules, and a great increase in interstitial cells. The epithelial lining of the tubules also shows very marked changes, the epithelial cells being few in number and more or less degenerated and irregular in shape.

In a chapter on the pathology of the retained testicle, Uffreduzzi discusses the various complications that are apt to accompany the condition of ectopic testicle and which, in order to differentiate them from the congenital complications, he designates as secondary or acquired. Among these are: pain and nervous disturbances; specific or chronic inflammation; gangrene and incarceration of the testicle; torsion of the cord in a series of 80 cases of torsion of the cord collected by Uffreduzzi, a retained testicle was found in 60 per cent).

The most common complication of undescended testicle is hernia of the congenital type, although in rare cases, it may be acquired. In all but two or three cases we have found a potential or actual hernia of congenital origin. Further complications are hydrocele of the cord and neoplasms.

That the retained testicle frequently becomes the seat of tumors, was first claimed by Lecomte, in 1851, and has since been confirmed by many others.

In my former paper[1] on the "Treatment of the Undescended or Mal-descended Testis," I stated that there was considerable difference of opinion in regard to the question of whether the undescended testis predisposes to malignant degeneration, and cited the various views pro and con. McAdam Eccles in his Jacksonian Prize Essay, 1903, stated that he had made an examination of 48,000 males with hernia at the London Truss Society, and found 2 per cent or 854 cases with undescended or mal-descended testes. Yet, in this entire series there was not a single case of sarcoma observed. He further stated that of 40 cases of sarcoma of the testis observed in one of the large London Hospitals during a period of 20 years, there was only one case of sarcoma of the undescended testis. From this fact he concludes that the generally accepted opinion that malignant disease is more common in the undescended than the normal testis, is not well founded. For many years I was inclined to agree with Eccles' opinion but further observations convinced me that it was wrong.

In my paper upon "Cancer of the Testis" with a report of 64 cases, read before the Southern Surgical and Gynecological Association, December 15, 1914, I stated that in 12 cases the sarcoma or malignant disease was associated with an undescended testis, and discussed the question of the relative frequency at considerable length. Different writers give different opinions as to the relative frequency of cancer of the normally descended and mal-descended testis. Odiorne and Simmons, in a review of 54 cases of malignant disease of the testicle observed at the Massachusetts General Hospital, found 6 or 11 per cent in which the disease occurred in the undescended testis; of these four were in the abdominal cavity and two in the inguinal canal. Rademacher gives the proportion of malignant abdominal to malignant inguinal testicle as 1 to 8. Meiser found 64 malignant inguinal against 4 abdominal testis. Bulkley, however, at the Presbyterian Hospital, found 2 cases of malignant abdominal to 12 cases of malignant inguinal testis. An analysis of the cases observed by Chevassu, Odiorne and Simmons and the Presbyterian Hospital records, show the proportion as 1 to 5. My own statistics show almost the same proportion, viz., 12 undescended testis in a total of 64 cases of sarcoma of the testis, or about 1 to 5½.

If sarcoma of the testis shows a relative proportion of incidence of 1 in the undescended testis to 5½ or even 8 in the testis in the scrotum, we have only to show that the relative proportion of undescended testis to normally placed testis is about 1 in 50 to prove that the abnormally placed testis is more prone to malignant disease than the normally placed.

With regard to the functional value of the undescended testicle, there is still a wide

[1] Ann. Surg., Phila., 1908, Sept.

difference of opinion, some writers going so far as to state that it has no functional value whatever and for that reason advocate its removal. Uffreduzzi believes that a considerable number of undescended testes, 10 per cent, retain the power of reproduction. While the data at present is insufficient to enable one to express a positive opinion it is probable that Uffreduzzi's estimate is not far from correct. Aside from any functional value that the testis may possess there is another strong ground for preserving it, particularly in children, and that is for the reason that the interstitial cells, which are always present have an important influence in developing the male characteristics of the child.

From January 1, 1890, to January 1, 1918, there have been operated upon at the Hospital for Ruptured and Crippled 334 cases of undescended testis, and since that time 31 additional cases (of these cases, 200 were operated upon by the writer personally, and the remainder by William T. Bull, John B. Walker, William A. Downes, J. P. Hoguet and the assistant surgeons); adding to these 50 cases operated upon at the Memorial Hospital we have a total of 415 cases of undescended testis. A most careful attempt has been made to trace these to final results.

In 49 cases the testis was found in the vicinity of the external ring just above the pubic bone; in 17 cases it was found in the upper scrotum; in 4 cases in the mid-scrotum, and in 16 cases it was impossible to locate it in any position (probably it had retracted in the abdominal cavity or had become too atrophied for palpation).

Age, as far as known, of patients operated upon for undescended testis.

	Cases
Under 5 years	33
5 to 10 years	160
10 to 15 years	133
15 to 20 years	29
20 to 30 years	16
30 to 40 years	7
40 to 50 years	5
Over 50 years	1
Total	384

The different varieties of ectopia or malposition of the testis are associated with slightly different types of sac, or variations in the size and location of the vaginal peritoneum.

The most common type of ectopia is that in which the testis occupies a position in the inguinal canal, between the internal and the external ring. An interesting point in connection with this form of ectopia is that while the testis never goes beyond the external ring the tunica vaginalis may extend down beyond the external ring even beyond the bottom of the scrotum. In certain cases this pouch passes beneath the deep fascia and finds its way down into the perineum, and in some still more rare cases, it passes down into the thigh.

The next most common type of ectopia is that known as "inguino-superficial" in which the vaginal process passes out of the external ring then turns directly backward and upward and extends 2 to 3 inches toward the anterior superior spine. In these cases the testis usually occupies the distal portion of the sac and rests on the outer surface of the aponeurosis directly beneath the skin and superficial fascia.

It is evident that a diagnosis should be made in these cases before operation, otherwise in cutting down to the aponeurosis, the first landmark of the incision for Bassini's operation, one would first pass through the testis before reaching the aponeurosis. The testis can be so easily felt in this superficial condition that a diagnosis should practically without exception be made.

This type, which was a few years ago regarded as extremely rare is comparatively common, seventy-seven cases having been observed in the statistics which have been kept at the Hospital for Ruptured and Crippled.

Another type is the inguino-perineal in which the vaginal process for some unknown reason, instead of entering the scrotum passes beneath the deep fascia and extends into the peritoneum for a varying distance sometimes reaching nearly to the anus. I have observed 8 cases. In these cases the cord is usually normal in length and by making a new pouch in the scrotum the testis and cord can easily be transplanted in the scrotum without any tendency to retraction. In

some of these cases the testis is normal in size and in other cases it is atrophied.

In a considerable number of cases a bilocular sac has been found in which the testis occupies the upper loculus which lies between the inner and external oblique muscle, the lower portion of which extends into the scrotum. In a smaller number of cases I have observed a bilocular sac, in which the upper portion assumes the inguino-superficial variety resting upon the aponeurosis beneath the skin and superficial fascia, and the lower loculus, extending down into the scrotum. In these cases the testis usually occupies the upper loculus.

Operative procedure. The method employed at the Hospital for Ruptured and Crippled since 1890 has been practically the Bassini operation without transplantation of the cord, namely: Bassini's incision, freely opening the aponeurosis of the external oblique well beyond the internal ring, surrounding the cord and hernial sac, which latter has always been found present with only two exceptions. Then the lower portion of the tunica vaginalis is grasped by an artery clamp and by traction the testicle is brought down as far as possible. The next step is separation of the sac from the cord, high up, just outside the internal ring. In children this requires very careful and delicate dissection with thumb forceps as the cord is usually greatly enlarged and spreads out in a fan-like manner over an area of the sac one inch in width. If the dissection has been begun at the right layer, the sac can be easily isolated and is then tied off as high as possible. In most cases of inguinal and in many cases of the abdominal ectopia the cord can be freed sufficiently to permit the testicle to be brought at least into the upper portion of the scrotum, in most cases into the lower part, with the sacrifice of but few, if any, of the veins. Except in a very few of the early cases, I have never made any attempt to anchor the testis in the scrotum, but rely upon careful freeing of the cord high up and the removal of all fascial bands. Suturing of the testicle within the scrotum is, in my opinion, of little value. If there is any tension, the scrotum is retracted up toward the external ring. The canal is then closed by the modified Bassini method, without the transplantation of the cord. The cord is brought out at the lower end of the wound. The internal oblique is then sutured to Poupart's ligament over the cord. Great care is taken in placing the lowermost suture, which should include the reflected portion of the external oblique as well as the conjoined tendon and Poupart's ligament on the other side. This suture, when tied, makes but a very small external ring, too small ever to permit the testis to retract into the canal, even should it reach the ring.

In cases in which it is found difficult to get the testis into the scrotum, and this is particularly true in the abdominal variety of ectopia, the admirable procedure advocated by Bevan, has been found of great value. In these cases we may remove not only the fascial bands, but practically all the veins and vessels, with exception of the vas and the spermatic artery.

Another excellent feature of Bevan's technique described in the *Journal of the American Medical Association*, 1903, is a purse-string suture in the region of the external ring, including the superficial and deep fascia, which not only prevents the testicle from entering the canal, but also from passing up on top of the aponeurosis.

Brief notes regarding patients traced from 10 to 20 years:

One patient, 15 years old, traced 19 years, testis in good position.

One patient, 13 years old, traced 20 years, testis atrophied and retracted to external ring.

One patient, 12 years old, traced 19 years, testis normal; patient married and has two children.

One patient, 10 years old, traced 14 years, testis found in normal condition.

One patient, 6 years old, traced 13 years, testis not felt.

One patient, 12 years old, traced 11 years, testis just below external ring.

One patient, 11 years old, traced 11 years, testis not down.

One patient, 11 years old, traced 11 years, testis not felt.

One patient, 10 years old, traced 12 years, testis normal in size and position.

One patient, 14 years old, traced 12 years, testis found in inguinal region superficial to aponeurosis.

One patient, 10 years old, traced 12 years, testis atrophied and situated at the spine of the pubis.

One patient, 12 years old, traced 10 years, position of testis not stated.

One patient, 7 years old, traced 11 years. testis atrophied, lying on top of external oblique.

One patient, 10 years old, traced 10 years. The testis was situated well down in scrotum and was half the normal size.

One patient, 18 years old, traced 10 years—double one side in scrotum ⅔ normal size—other side not felt.

Cases traced from 5 to 10 years.

One, 5 years old, traced 7 years, testis atrophied, outside of external ring.

One, 9 years old, traced 8 years, testis normal size, at bottom of scrotum.

One, 11 years old, traced 6 years, testis just without external ring.

One, 4 years old, traced 5 years, position of testis not stated.

One, 11 years old, traced 8 years, testis down and normal in size.

One, 5 years old, traced 6 years, position of testis not stated.

Double inguino-superficial, 10 years old, traced 5 years, position of testis not stated.

Boy, 8 years, inguino-superficial, traced and well 5 years, position of testis not stated.

Double, 11 years old, traced and well 8 years, size of testes not stated, right in scrotum; left in mid-scrotum.

Double inguino-superficial, boy 12 years old, traced 9 years, position and size of testes not stated.

Boy of 4, traced 5 years, position of testis not stated.

Boy of 14, inguino-superficial, traced and well 9 years, position of testis not stated.

Boy of 7, traced 9 years, testis can be easily pulled down into bottom of scrotum.

Boy of 14, double, traced 7 years, right testis, inguinal left, abdominal type, position of testes not stated.

Boy of 13, properitoneal, traced 7 years, testis outside of external ring, freely movable.

Boy of 6, traced 6 years, testis small, at bottom of scrotum.

Boy of 11, traced 6 years, testis half normal size, position external ring.

Boy of 4½, traced 8 years, testis not felt.

Boy of 8, traced 8 years, testis just above external ring.

Boy of 5, traced 5 years, testis at external ring.

Boy of 11, traced 5 years, both testes in bottom of scrotum.

Boy of 14, traced 5 years, position of testis not stated.

Boy of 13, double inguino-superficial, traced 5 years, both testes in scrotum and freely movable.

Boy of 10, traced 3 years, position of testis not stated.

Boy of 9, traced 5 years, position of testis not stated.

Final results in the cases observed at the Hospital for Ruptured and Crippled:

Traced and Well	Number of Cases
More than 20 years	1
From 10 to 20 years	16
From 5 to 10 years	41
From 2 to 5 years	60
From 1 to 2 years	31
From 6 months to 1 year	21
Less than 6 months	15
Not traced	149
Total	334

In the cases of adults as far as results are known, the testis has shown a greater tendency to remain in the scrotum than in children. The most important end-result in an adult is that in the case of W. N. male, who had double undescended testes 30 years, who was operated upon in 1895 on the left side by Dr. Schoonmaker, of Yonkers, and in 1910 on the right side by myself, at the Memorial Hospital. He was married in 1902 and had a child born in April, 1903.

This case is of particular interest, inasmuch as it is the second case that I have been able to find recorded in which a patient suffering from double undescended testes has become a father.

Another interesting case:

W. G., 37 years old, was operated upon 23 years ago for a right undescended testis. I had an opportunity of examining this patient on December 11, 1918, and found the testis absolutely in the bottom of the scrotum. It was normal in size and felt just a little less firm in consistence that the opposite testis. The patient was married two years ago and up to the present time has had no children. In this case, I think, the longest period has elapsed since the operation (23) years.

CONCLUSIONS

A careful study of our cases, together with the literature of the subject, has led to the following conclusions:

1. That in most cases of undescended or mal-descended testis, the etiology points to a congenital origin, often influenced by the element of heredity and frequently associated — particularly in the double variety — with other developmental defects.

2. The atrophy usually found in the undescended or mal-descended testis is not the

result of the mal-position. The change in structure and the atrophy are merely coincident, being due to congenital causes.

3. The question of the functional value of the undescended testis, cannot be definitely answered in an individual case. It may be stated, however, as a general rule that an undescended or mal-descended testis, with which there is associated a marked atrophy, has little or no functional value. However, I believe with Uffreduzzi that in a considerable number of cases of undescended testis, spermatogenesis is retained.

4. The ectopic testicle is practically always associated with an open vaginal process of peritoneum; i. e., there is usually present a potential hernia. This vaginal process is almost invariably a congenital affair, for the reason that its position is entirely independent of the location of the testis.

5. Torsion of the cord is more frequently observed in the undescended testis than in the normal testis.

6. The undescended testis shows a greater tendency than the normal testis to malignant degeneration.

7. Operation should be advocated in children who have reached the age of 8 or 10 years, for the following reasons: (a) Operation permits the radical cure of the hernia with which the undescended testis is practically always associated and which often cannot be controlled with a truss without causing pain and irritation to the testis. (b) By bringing the testis down into the scrotum before the age of puberty, there is a possibility of causing further and more normal development of the testis.

8. Operation in adults or children over the age of 14 should be even more strongly urged. for the following reasons: (a) In order to cure the accompanying hernia, as has already been stated; (b) in order to place the testis in a position in which it is much less subject to trauma; (c) in order to lessen the chances of malignant degeneration.

9. The end-results in our series show that it is possible to cure the hernia in practically all cases. Unfortunately, in only a comparatively small number of cases did we find the testis occupying the bottom of the scrotum in the cases observed, several years after operation. The atrophied testicle is generally found to have retracted to mid-scrotum or in the region of the external ring and in a position somewhat less liable to trauma than before operation. The result accomplished by the operation, the cure of the accompanying hernia, would seem to justify advocating operation for the undescended testis in adults.

10. The question of whether the traumatism incident to the operation on the undescended testis might not favor the development of malignant disease, is one that should be considered — however at present it cannot be answered definitely. It should be noted that in none of the series of cases operated upon at the Hospital for Ruptured and Crippled during the past twenty-nine years has malignant disease been known to develop; however I have personally observed one case of sarcoma of the testis in which the disease was either present at the time or developed shortly after the operation for undescended testis; possibly it had already started at the time the operation was performed. (The operation was performed by another surgeon.)

These conclusions differ slightly from the conclusions of my earlier paper. In that paper I stated that the undescended testis is almost invariably of little or no functional value. I believe this statement is somewhat too strong and should be modified to the extent that the undescended testis is probably of functional value in not more than 10 per cent of the cases.

I still believe that the undescended testis should never be sacrificed in children and that the practice which obtains in some of our hospitals, of removing the undescended testis in a large number or even in the majority of cases, is greatly to be deprecated. Even if the testis be of little functional value, it nevertheless is of great value in developing the male characteristics in the child and promoting general health. In the adult it should likewise be retained for its influence upon the mentality and for the moral effect if for no other reason.

As regards the age for operation, I still believe that operation is seldom indicated

under the age of 8 years. If the hernia is so slight as to be of little or no importance, it is better to wait until the child is 10 to 12 years old before operating.

I still believe that abdominal ectopia, unless double, had best be left untreated, inasmuch as the operation is a difficult one and by no means free from risk.

In children, however, I would never allow a case of double undescended testes to reach the age of puberty. In these cases it is safer to do the operation in two stages, operating on one side at a time.

It is interesting to note that there has been no death in this entire series of 415 operations.

PROSTATECTOMY, WITH ITS PREPARATORY AND POSTOPERATIVE TREATMENT[1]

By BRANSFORD LEWIS, M.D., B.Sc., F.A.C.S., St. Louis

IF one would do satisfactory and *successful* prostatic surgery, he should give close and searching attention to three phases of treatment, namely: (1) preparatory, (2) operative, and (3) postoperative.

The first of these is by some esteemed too lightly, leading to disaster in individual instances that might assuredly be avoided. Strong convictions on this point inspire serious questioning, for instance, of the propriety of operators making rapid-transit trips into the country, operating and returning home on the same day, without knowing any of the elements of diagnosis or providing any of the various conditions deemed essential to success by practically all of the leaders in this work of the present day. The wonder is that any success can be attained by the use of such precipitate and impolitic methods. In the writer's opinion this is unpreparedness to the degree that seriously prejudices the chances of the patient and brings discredit on a special line of surgery that, under proper and conservative conditions, works wonders for a very miserable portion of humanity.

The most experienced operator cannot always tell, on the first interview with a patient, as to whether an operation will be necessary or even advisable. Many patients with marked prostatic obstruction and in serious condition of health may be brought to permanent recovery without any operation; and it requires definite study and observation over a number of days, sometimes, to bring these to recognition.

In many others — indeed, in a very large proportion of them — even if operation be advisable or necessary, preliminary drainage through the retained urethral catheter is of the utmost importance, converting a critical situation into a satisfactory and safe one; or supplanting agony with quiet and comfort, preliminary to operation.

These considerations are vital in their bearing on final success, but are necessarily ignored when the rapid-transit plans alluded to are adopted.

PREPARATORY TREATMENT

Besides information on the physical condition and functional activity of the heart, kidneys, and alimentary tract required in all such cases prior to undertaking operation, accurate estimates should be made on the following in particular:

1. Hæmoglobin percentage.
2. Cell count.
3. Blood pressure.
4. Phthalein output of the kidneys.
5. Urine quantity and amount of solids in 24 hours.

Gross deviations from the normal in these should be corrected or improved before operating. Fortunately this is possible in practically all cases, through the various measures of drainage, heart-toning and alimentary regu-

[1] Read before the Southern Surgical Association, Baltimore, December 18, 1918.

lation now generally utilized. Proctoclysis, drop method, of 5 per cent sodium bicarbonate solution, six hours daily, proves of wonderful efficacy in restoring the functions of a dilapidated old man, undermined by urinary obstruction, retention, infection, pain, recurrent chills and fever. But *efficient drainage* is the *sine qua non* of all requirements, before, during, or after operation. Interrupted catheterization in no sense fulfills the demands in urgent cases. It occasions much suffering each time it is used, in the badly inflamed cases; and is often attended with steadily increasing difficulty of introduction, all of which is done away with by binding the catheter in the urethra with string and a few pieces of adhesive plaster judiciously applied. Nothing gives such immediate comfort as this, in many instances; and once attained such drainage can be continued until the critical situation is over and all things are favorable, or as nearly so as they may be made for the operation. It gives opportunity for daily irrigations, whose effects may be both soothing and antiseptic. In a particularly difficult and complicated case of 70 years of age the writer kept a catheter in the urethra for nine months before bringing the patient to a condition appropriate for operation; after which the operation was done with success and prompt recovery.

Hæmoglobin above 60 per cent is favorable; 50 per cent is questionable; 40 per cent unfavorable; 30 per cent fatal, in connection with prostatectomy.

While the phthalein output should be above 30 per cent for two hours to present a promising outlook, I believe the requirements are not so rigid as with the hæmoglobin percentage; and that patients can be carried through to success, in the face of very low phthalein percentage, if all precautions are taken in regard to preparation, anæsthesia, and postoperative care. At least, we have had such experiences. Low phthalein returns do not lead us to abandon operation but impel us to adopt all the different measures of safety and conservatism that have been instrumental in lowering the death rate of prostatectomy of late years.

A peculiar fact pertaining to some cases of chronic prostatic obstruction, apparently in fair general condition, is that they are really on the verge of a renal break down, ready to be toppled over into urinary suppression and death by any untoward or unusual circumstance. This portentous condition (impending acidosis) is often to be detected not so much by the quantity of urine passed in 24 hours as by the quality: An enormous quantity of clear, limpid urine is poured out, but of low specific gravity (1.003–1.005) and lacking in solids and urea-content. Acetones may be present. Beware of such cases, and install the therapeutic measures with the utmost caution from every standpoint. Activity or inactivity is liable to be equally disastrous. The patient has simply postponed the definite effort at recovery for too long a time. He has reached a dangerous state and doesn't for a moment suspect it. I have seen such patients dead in two or three days from the time of the upset, and without any operation being undertaken or any serious measures being adopted. Suppression of urine, uræmia, acidosis, whatever the terms applied, the outcome is death, and represents the fallacy and danger of procrastination.

CHOICE OF OPERATION

Without going into a discussion of the merits and demerits of the two methods of removal of the prostate, suprapubic and perineal, the writer after a considerable experience with both has adopted the suprapubic method as the one of choice *because it gives the better results*. It is free from a number of momentous objections that unavoidably pertain to the perineal operation, such as ineffectual urinary control, sexual disability, urethrorectal fistula, etc.

One or two stage operation. While a one-stage suprapubic prostatectomy may with confidence and safety be carried out in a patient of middle age and good general condition, there is no doubt about the marked and distinct advantages presented by the same operation done in two stages in the decrepit patient of advanced years and weakened resisting powers. The opportunity presented by the two-stage operation of establishing a firm adhesion between

bladder and abdominal walls is scarcely less valuable than that of establishing suprapubic drainage. Infection of the loose connective tissues surrounding the bladder and extensive suppuration in these is one of the most serious dangers attendant on suprapubic work. Once established, such suppuration is difficult of control and the condition may rapidly become formidable. The ounce of prevention consists in attaching the bladder firmly and permanently to the abdominal wall around the opening in the bladder by means of chromatized catgut sutures.

Since adopting this technique, further described below, the writer has had no semblance of deep spreading infection in any case. Its protecting influence was markedly shown in a recent case in which through inadvertent deviation from the prescribed technique an infection of the suprapubic wound occurred; but this infection did not spread beneath the muscles or in the cellular tissue about the bladder because of the close and firm attachment between the bladder and abdominal wall which had been provided.

Because of these considerations and their bearing on events *subsequent* to the operation, the author deems exactitude of technique logically carried out as well worth while, even though the steps may seem more formidable than the ones of former days for getting into the bladder. It is easy enough to get into a bladder; but getting out again with a healed wound and a recovered patient — that is the question for our consideration.

CHOICE OF ANÆSTHESIA

If the patient be vigorous in health and condition, ether may be given with impunity, but if very old, debilitated or septic, it may not be justifiable to deprive him of the well-defined advantages presented by local anæsthesia for the first stage, and a very transient gas or ether anæsthesia, or preferably, caudal (sacral) anæsthesia, for the second. This plan is practically free from shock in all cases; and there is seldom disturbance of the alimentary tract.

Spinal anæsthesia is commended as serviceable by some operators, but the writer views it as the most dangerous of all methods of anæsthesia. His personal acquaintance with some seven or eight instances in which death was attributable directly to spinal anæsthesia used by operators well versed in its technique has led him to this conclusion. He knows of no death so far reported from the use of caudal anæsthesia, although there have been instances in which physiological effects have been observed.

SUPPORTIVE MEDICATION

Very many cases demand the supporting influence of digitalis preliminary to operation, of diuretics and the free ingestion of fluids, water, milk, buttermilk, and possibly pituitrin hypodermatically to arouse alimentary activity. A laxative effect is preferable to too much purging before operation.

OPERATIVE TECHNIQUE—TWO-STAGE OPERATION

First stage, local anæsthesia. Light nourishment is not objectionable previous to transferring the patient to the operating room.

1. A hypodermic of ¼ grain morphine, 1/150 grain atropine is given 15 minutes prior to operation.

2. The bladder is given a final irrigation with warm boric acid solution, and the catheter retained in the urethra by means of a small strip of adhesive running from the penis to the catheter. Six or 8 ounces are left in the bladder. Iodine is applied to the skin.

3. Using procaine and potassium sulphate solution (2 per cent each, equal quantities), a linear area is injected about 3 to 4 inches in length in the midline of the skin above the symphisis pubis (Schleich method). An incision is immediately made through this line down to the rectus muscles, which are separated in the midline by the fingers and the scalpel handle. The injections of anæsthetic fluid are repeated as often as may be necessary to avoid pain and apprehension on the part of the patient. It is unnecessary to cause pain in this procedure.

4. When not objectionable from the standpoint of obesity, difficult respiration, cardiac, renal or arterial complications, the patient is now placed in a moderated Trendelenburg position. It is probable that the Trendelen-

burg posture is not as innocuous as it is generally considered to be, so that its duration should be shortened as much as possible. It is desirable to have the dome of the bladder project well up into the wound. This may be effected by adding, if necessary, a few ounces of fluid to the contents of the bladder, through the catheter which still lies in the urethra.

At the bottom of the wound and still covering the bladder are the loose prevesical tissues and the lowermost fold of the peritoneum, so merged together that they are not always distinguishable. Not a few good operators have inadvertently cut the peritoneum and have had to take time to stop and sew it up — an unnecessary delay. The writer avoids this by invariably laying aside the knife and using the gauze covered forefingers to separate the tissues, strip up the peritoneum and definitely expose the bladder. The latter is recognizable by its muscular bundles and large veins. Three retractors maintain the exposure: right, left, and upward, the latter with a piece of gauze under it to protect the peritoneum which is pushed well upward.

6. Then, removing one lateral retractor, a chromatized catgut "fixation suture" is placed. It is passed through the fascia and muscle (rectus) of one side, then penetrating the full thickness of the musculature of the bladder, at a point ¾ inch from the midline, it is directed downward for ¾ inch before emerging, passing again through the rectus muscle and fascia of the same side. Another suture is applied similarly on the opposite side, after which a third is applied crosswise above, just below the margin of the peritoneum. These three sutures, when tied later, draw the bladder up squarely against the under surface of the abdominal wall, making a firm agglutination that prevents the burrowing or spreading of infection, that is one of the most serious complications of suprapubic cystotomy. At present the sutures are left untied and are used as anchorages on the bladder wall. The bladder is now emptied by attaching a long rubber tube to the catheter and syphoning the contents into a waste-basin.

This allows the apex of the bladder to sink down into the pelvis, but it is readily brought back and controlled by means of the three fixation sutures.

7. A narrow sharp bistoury is made to puncture the bladder wall (always anticipating with local anæsthesia); the incision is extended above and below sufficiently to provide for the easy introduction of a finger, and, later, of the large Marion drainage tube. By syphoning the fluid out before making the incision a relatively dry operative field is obtained, instead of the sloppy one usually encountered in cystotomy.

8. Through the bladder wound the offending prostate is felt, the catheter is recognized and indicates the exact location of the inner urethral orifice, and the presence or absence of a foreign body is determined. The catheter is then removed, being no longer of use.

9. The Marion tube, containing a perforated stopper, and catheter, is now inserted into the bladder. The three fixation sutures previously placed are tied, drawing the bladder firmly against the abdominal wall, as before described, and obliterating spaces for seepage. The long ends of these sutures may be tied about the Marion tube for anchorage. The remainder of the wound is brought together, the muscle layers with catgut, the skin with silkworm gut. It is often advisable to place a small cigarette drain in the lower angle to drain the prevesical space. Dress and return to bed.

10. For effecting continuous drainage a rubber tube is attached to the Marion tube catheter, intermittent suction being added by means of a Bremerman apparatus or some similar appliance. The patient is made to change position occasionally from his back to either side, and liquids or light nourishment are given from the beginning, there being no shock or alimentary disturbance to deal with.

Any undue amount of pain is controlled with codeine or morphine; and continuation of the proctoclysis, six hours daily, is wonderfully efficient for promoting activity of the kidneys.

Operative interval. From the first to the second stage of the two-stage procedure a

week or two weeks may elapse, according to the condition of the patient and the rapidity of his recuperation from previous disability. Improvement may be noted not only in his daily declarations on the subject, but also in the responses to the several laboratory tests.

Second stage. At the end of this interval when conditions are found satisfactory it is proper to carry out the second stage of the operation, namely, the removal of the prostate.

1. With the patient under gas-ether, or simply ether anæsthesia and again in the semi-Trendelenburg posture if permissible, the Marion tube is removed. Its ample diameter has maintained such a good-sized opening into the bladder that it may be unnecessary again to enlarge the wound except very little at its central portion. The forefinger of the left hand is inserted into the rectum to afford counter-pressure and to elevate the prostate into the wound.

2. If we are dealing with a "small hard prostate" its mucosa may be dense and resistant to the attacking finger, in which case it may be of advantage to use the double cutting blades for slitting the prostatic urethral mucosa, as first suggested by Spitzer, and as modified by the author. This admits the glove-covered finger to the line of cleavage to better advantage in certain cases.

Cleavage is best begun at the prostatic apex on one side, the finger separating and at the same time hooking the offending lobes backward (upward). No objection can be made to the endeavor to bring out the prostate in one or two pieces, although this is not always feasible. A medium sized lobe-forceps held by an assistant and grasping a recalcitrant lobe sometimes gives gratifying service and permits the peeling off of attached mucosa. Every piece of prostatic outgrowth should be removed, including that under the trigone.

3. Some oozing or bleeding may follow the removal of the lobes. It may be controlled in either of several ways: Direct suturing; packing with gauze; or preferably, temporary hot gauze pressure, followed by the placing of a Hagner or Pilcher rubber air-bag, with which continuous pressure is made against the walls of the prostatic cavity for 12 or 24 hours, relaxation being permitted when the risk of bleeding has subsided. If the bleeding should be renewed at a later time it is easy again to inflate the bag and re-establish the pressure. If there is no serious bleeding and the pressure-bag is omitted, the writer is accustomed to place a *retained catheter* in the urethra at this time, adjusting it perfectly by means of a silk suture placed through its eye-end, drawn out of the suprapubic wound and affixed to a strip of adhesive plaster attached to the abdomen. The placing of this catheter at this time is for the purpose of avoiding the necessity of introducing it one or two days later when the various conditions are less favorable. It is highly objectionable to try to pass a rubber catheter through the recently wounded prostatic urethra, the walls of which are raw and very susceptible to infection.

4. The Marion tube is again made to drain the suprapubic wound at least 24 hours, serving for easy removal of clots in case of necessity, and the catheter it contains makes direct connection with the long rubber tube leading into the drainage-bottle. Interrupted suction as before is utilized for inducing good drainage.

5. *Suturing of the wound.* The opening in the bladder is first narrowed by chromic catgut suturing until it hugs the Marion tube snugly. The muscular layers of the wound are brought together with the same material; after which interrupted sutures of silkworm-gut are placed through the skin, one of these being tied round the Marion tube for anchorage. It is considered essential to leave a small cigarette drain in the lower angle of the wound, at least as deep as the prevesical space; to be removed within the first day or two.

AFTER CARE

Renewal of the proctoclysis (of sodium bicarbonate solution 5 per cent) may profitably be instituted on returning the patient to bed. This supports both renal and cardiac activity. Hypodermics of ampoules of pituitrin every 4 hours will have a similar influence

on the intestines, avoiding stagnation and flatulence. These three functions of the kidneys, heart and alimentary tract are of supreme importance in the next three or four days. If they are kept intact there is little likelihood of anything going wrong.

The patient should be encouraged to take fluids as soon as the stomach is settled; and to turn on either side, as well as on the back.

Sedatives are indicated if the patient is in pain or unable to sleep; veronal and trional, 5 grains each, at bed time, for the latter.

The Marion tube having performed its office of protection against clot formation is removed in the first 24 hours, being replaced with a smaller elbow-tube or large catheter; or if conditions seem especially favorable, dependence may be placed for drainage on the catheter that was tied in the urethra after the operation. Closure of the bladder wound may be expedited by tying at this time (second or third postoperative day) the sutures attached to each side of the bladder wound, and left long for that purpose.

Naturally one must use judgment in adopting one course or another, always acting on the safety-first policy with regard to drainage, and possible infection. Without free and adequate drainage complications are sure to arise. To secure this free drainage, some surgeons go to the length of leaving the suprapubic wound wide open and without a tube of any sort, the urine seeping up into thick pads of absorbent cotton that obviously require frequent changing.

This seems to the writer a most miserable and unwholesome plan and as unnecessary as it is unattractive. As a matter of fact, a mild degree of infection nearly always occurs in that portion of the wound through which drainage is maintained; but with the protecting measures fully carried out as described, it is practically never serious and should not retard the closure of the wound, which should occur in from two to three weeks. During this time the urethral catheter is used for continuous drainage. Being already in place, the evils of attempting to introduce it under adverse conditions (through a disorganized prostatic urethra, etc.) are avoided; and its cleansing is easily accomplished by drawing it up through the wound by means of the thread previously mentioned. This gives complete control and without any disturbance. After a week or ten days, when the wound becomes small, the thread is cut off and the catheter is still retained, this time by means of adhesive strips on the penis.

The patient is permitted to sit up in bed about the fourth day after either the first or second stage of operating, but nothing is to be gained in having him get out of bed at this early period, as has been claimed by some operators.

Within 24 hours after operation it is found useful to add one or two grains of calomel, in half grain doses to the pituitrin; followed a few hours later by a mild saline laxative. After this a daily dose of one of the neutral oils is serviceable.

POLYPOSIS OF THE STOMACH[1]

By D. C. BALFOUR, M.D., F.A.C.S., Rochester, Minnesota
From the Mayo Clinic

THE benign tumors of the stomach, fibromata, myomata, and adenomata, because of their relatively low incidence, obscure symptomatology, and unknown etiology have always been of great interest, particularly from a surgical standpoint. It was, then, with considerable satisfaction that we recently added to our collection of benign gastric tumors a perfect specimen of the rarest member of the group, a gastric polyposis. The fact that this is the first time the condition has been found in approximately 69,000 abdominal sections in the clinic, 8,000 of which were for gastric lesions, and that a correct diagnosis was established before operation, is sufficient to make the case most unusual.

Case 250518, a man, aged thirty-one, came to the Clinic November 8, 1918, because of "stomach trouble"; a careful elicitation of the history disclosed relevant facts as follows: In 1910 the patient began to have periods of unexplained loss of appetite; during the following five years this periodic anorexia was a great annoyance. The symptom which finally brought him to the Clinic, pain with an empty stomach, first manifested itself in 1915. For a short time after its onset the pain showed some periodicity, but during the greater part of the three years it has occurred daily. The patient described the pain as a cramp beginning in the right and in the left hypochondrium and radiating toward the midline of the epigastrium; it was not associated with burning or with the usual subjective symptoms of hyperacidity, although it occurred only when the stomach was empty. He further stated that the stomach seemed to empty very rapidly and that the period of freedom from cramps after the ingestion of food had become increasingly shorter. By frequent eating he had kept his distress at a minimum and his nutrition was practically normal. There had been no nausea or vomiting or evidence of gastric bleeding. The patient had been discharged from the army in 1917 on a diagnosis of pulmonary tuberculosis, and after five weeks in a sanitarium, home treatment was maintained until June, 1918.

The physical examination did not disclose any abnormal findings. There were no evidences of pulmonary lesion either clinically or by X-ray, and the Wassermann test was negative. The test-meal showed an absence of free hydrochloric acid and the presence of a considerable quantity of epithelium. This achylia explained in a measure the symptoms of which the patient complained, and considered with the character of the gastric pain and the fact that it had been continuous over a period of almost three years, practically excluded gastric or duodenal ulcer. The only clue which led to preoperative diagnosis, was secured by X-ray examination. The entire pyloric end of the stomach exhibited a diffuse mottled appearance, apparently well demarcated both at the pylorus, and at a line about 4 inches

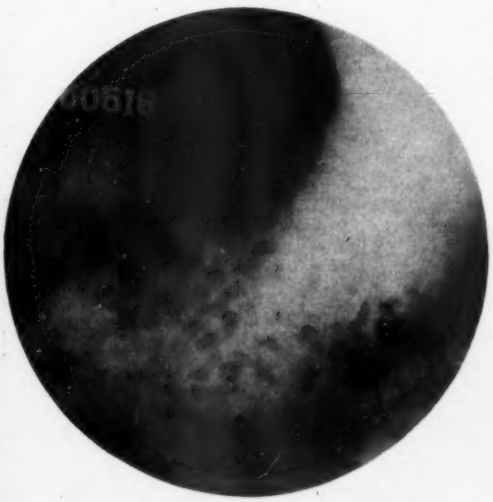

Fig. 1 (250518). The mottled appearance (dark areas) in the roentgenogram are shadows due to the polypi in the stomach. See specimen Figures 2 and 3.

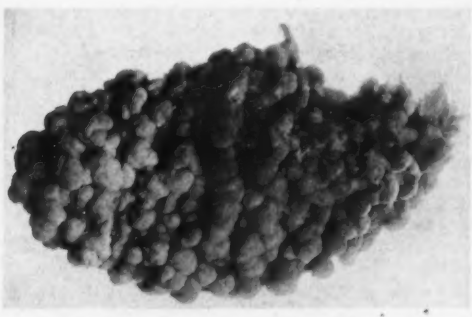

Fig. 2. Photograph of specimen.

[1] Presented before the Southern Surgical Association, Baltimore, December, 1918.

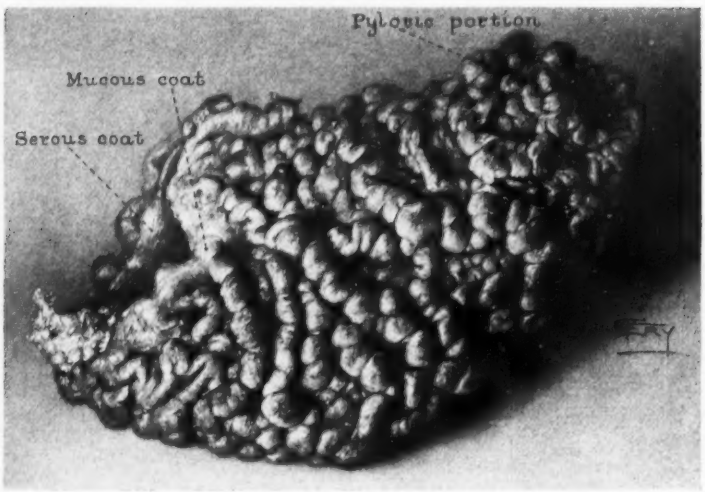

Fig. 3. Drawing of polyposis of the stomach. Stomach turned inside out.

from the pylorus. Dr. Carman, after a re-ray, at which any possibility of complicating factors, such as the patient's having taken food before the examination was excluded, made a diagnosis of gastric polyposis (Fig. 1).

The operation was done November 19 by Dr. Sistrunk. On inspection the stomach was found to be normal in appearance; on palpation, however, a soft, doughy thickening of its wall extending from the pylorus to a line about 5 inches above was immediately evident, and although this did not give the sensation of an actual tumor, the lines of demarcation were quite definite and corresponded with those apparent in the roentgenograph. Resection was carried out along these lines; about two-fifths of the stomach was removed. Continuity was reestablished by the method which we have found most satisfactory, that is, antecolic end (gastric) to side (jejunum) anastomosis. Immediate examination of the tumor showed a most typical example of the condition which has been described as gastric polyposis. Examination of the mucous membrane of the stump of the stomach showed that the polypoid changes did not entirely cease at the line of resection, and that small globular masses were present at various points on the mucous membrane, particularly along the summit of the rugæ, which in turn were very markedly hypertrophied. This finding created some uncertainty as to the ultimate result, but it is not unreasonable to hope that the removal of the greater portion of the diseased tissue will have a curative effect on the isolated tumors that were not removed.

Further study of the resected stomach revealed that it conformed to the type of polyposis which has been described by the French (Menetrier) as *polyadenomes polypeux*. The fresh specimen exhibited no changes except in the mucous membrane. No infiltration of the coats had taken place, and the specimen could readily be turned inside out. The mucous membrane was highly congested and tumors of various sizes were distributed over the entire surface. These tumors were globular and were arranged noticeably in rows in the transverse axis of the stomach; the masses were in close apposition to each other, as is shown in Miss Fry's drawing (Fig. 3). The intervening mucous membrane between the rows showed a few much smaller isolated globular elevations (Fig. 2). The great majority of the elevations were of the size of a hazel nut, and 250 of them could easily be counted; individually they were soft and velvety to the touch, and gave no macroscopic suggestion of malignancy or of destruction of tissue. A section of the gastric wall containing a tumor examined microscopically showed the bulk of the tumor to be composed of a tremendously hypertrophied mucous membrane. No hyperplasia of glandular element was of a character to suggest malignancy. The pathologists believe the condition is not malignant; this

corresponds with the generally accepted view. The patient made a very satisfactory recovery, and returned to his home December 16, 1918.

From a study of this case in conjunction with such cases described in the literature, it would appear that gastric polyposis has sufficient characteristics to be classified as a separate entity and should not be confused with single polyps or papillomatous masses (the latter usually malignant) occasionally found in the stomach, and to which the term gastric polyposis has at times erroneously been applied. No positive etiologic factors are known, and elaborate investigations in our own case, both before and after operation, failed to reveal any clue. It should be emphasized in this instance that the condition would have been quite unsuspected had it not been for the roentgenograph and its interpretation. It is also of interest that in the only other similar case described in this country — that of Myer — a pre-operative X-ray diagnosis was made by Carman. The age of the patient, 31 years, is unique because it is the earliest age at which the condition has been recognized. The accurate and early diagnosis, leading to the correct indications for treatment, is an excellent illustration of the advanced methods of diagnosis available to the clinician of today.

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THE RÔLE OF THE CYSTIC DUCT IN RECURRING CHOLECYSTITIS[1]

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CLINICALLY the pathologic processes involving the cystic duct which serve as factors in recurring cholecystitis may be divided into, first, those that interfere with the lumen of the duct and thus cause stagnation in the gall-bladder making it a good incubator in which bacteria may grow, and, second, those that harbor infective organisms which may pass up into the gall-bladder with the bile as it flows upward.

Before taking up a discussion of the pathologic processes, it is best to review briefly the anatomy and physiology. The cystic duct is about 3.7 centimeters in length and averages about 3 millimeters in diameter. It leaves the gall-bladder with somewhat of an S-shaped curve and passes downward and inward between the layers of the lesser omentum to unite with the hepatic duct to form the common duct. It has three coats which are from within outward: mucosa, muscularis, and fibrosa.

The mucous membrane is continuous with that of the gall-bladder and like that is lined with columnar epithelium. Mucous glands are found beginning on the surface of the mucosa and extending through into the deeper layers. The glands consist of a straight portion lined with columnar epithelium (Fig. 1) and a coiled portion in which the cells may approach the cuboidal (Fig. 2).

A series of valves known as the valves of Heister are alternately arranged along the entire length of the duct (Fig. 3). The valves are crescentic in shape and extend transversely. At the upper end they are thicker, closer together and project well into the lumen. They gradually diminish in size, become farther apart and irregular in distribution, as the lower end of the duct is approached. In the center of the valves are found connective tissue and muscle fibers. They are covered with mucous membrane like the remainder of the duct

[1] Read before the Surgical Section of the American Medical Association, Chicago, June, 1918.

Fig. 1. Straight portion of mucous gland lined with columnar epithelium.

Fig. 2. Coiled portion of mucous gland lined with cuboidal epithelium.

Fig. 3. Heisterian valves showing more or less hypertrophy.

except mucous glands are not present. Moynihan states that these valves are folds of mucosa, but this is an error, for muscle fibers from the muscularis enter the valves.

The muscular coat is made up of circular, longitudinal and diagonal fibers of which the circular predominate. The amount of muscle is greatest near the gall-bladder, whence it gradually decreases, there being the least near the juncture with the hepatic duct. The circular fibers extend into the heisterian valves as do also the ends of some of the longitudinal fibers so that when the muscle of the duct contracts the folds become erect and are drawn closer together thus interfering with the size of the lumen by narrowing it and also by drawing the valves nearer each other. In pathologically enlarged valves the lumen may be entirely closed by the mere contracting of the longitudinal fibers bringing the valves together. The diagonal fibers do not enter into the formation of the valves.

The fibrous layer is made up of connective tissue loosely connected with that of the lesser omentum.

The function of the cystic duct is not merely that of a tube connecting the gall-bladder with the other ducts, but through the valves and its muscles the flow in and out of the gall-bladder is regulated to a certain extent and through the peristaltic muscular contractions the duct has expulsive power.

PATHOLOGY

Only a brief résumé of the pathology will be given; the lesions will be considered according to the following outline:

I. Obstruction, partial or complete.
   A. Intrinsic or those which lie in the lumen or extend into it.
   B. Intramural or those which involve the wall of the duct.
   C. Extrinsic or those which lie outside of the duct and produce obstruction by pressure or by angulation through pulling the duct out of its normal position.

II. The processes which harbor infection are classified as:
   A. Intrinsic or those in which the organisms grow within the lumen.
   B. Intramural or those processes in which the organisms are harbored within the wall of the duct and thence discharged into the lumen.

I. Obstruction. A. Intrinsic.

1. Foreign bodies. Gall-stones are the most frequent. Plugs of mucus sometimes obstruct although probably not so frequently as was formerly supposed. Worms and echinococcus cysts have been reported as found in the cystic duct.

2. Pathology of the heisterian valves. While undoubtedly other processes occur, up to the present I have observed only three: œdema, acute inflammation, and chronic hyperplasia. The œdema here referred to was a part of a general œdematous condition involving the remainder of the duct as well. The acute inflammation was a part of a general process involving the entire duct and gall-bladder showing nothing characteristic in the valves.

The most important lesion is chronic

Fig. 4. Hypertrophied heisterian valves showing manner in which obstruction is produced.

Fig. 5. Marked hypertrophy of an heisterian valve.

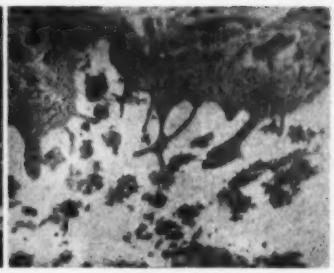

Fig. 6. Villous growth in a cystic duct.

hyperplasia, because it interferes with the lumen of the duct more or less. The hyperplasia may involve all of the valves or only a part of them (Fig. 4). The valves, instead of being narrow, projecting folds, become broad, blunt, projecting masses which may lie so close together that when the circular fibers of the duct contract they are erected and thrown inward so that they may pass while the longitudinal fibers draw them together at their bases until they may nearly or entirely touch, thus producing a partial or complete obstruction. In this manner a biliary colic may be produced that is identical clinically with that produced by gall-stones. Sometimes but a single valve is enlarged in which case the hypertrophy may be more marked (Fig. 5). Occasionally they are larger than the lumen of the duct and as viewed by the microscope are bent upon themselves so as to extend lengthwise of the duct, usually pointing downward. When there is marked hypertrophy, contraction of the circular fibers down upon the valve will completely occlude the duct.

Histologically the hyperplasia is due mainly to connective-tissue increase although sometimes there is hyperplasia of the muscle fibers as well. I have seen dilated mucous glands in some of the enlarged valves although I have never seen glands in normal valves.

3. *Ulcers.* Ulcers are the result of pressure from stones, the action of infective organisms within the duct or the toxin of such organisms and infection within the walls of the duct with sloughing of the infected area into the lumen. Some ulcers show considerable induration. Interference with the lumen comes through induration and muscle spasm.

4. *Carcinoma.* I have never observed a primary carcinoma of the duct.

B. Intramural lesions.

1. *Strictures may be congenital or acquired.* The acquired usually follow injury from gall-stones, the healing of ulcers or intramural infection.

2. *Localized* infection may be due to organisms coming through the blood stream, extension into the mucous glands or by direct extension from within or without.

3. *Cysts* or other *enlargements* of the mucous glands.

4. *Hyperplasia.* (a) Hyperplasia of the muscle is usually the result of a partial obstruction of the cystic or common ducts. (*b*) Connective-tissue hyperplasia is usually preceded and accompanied by a chronic infective process.

5. *Œdema* of the cystic duct may be a part of a general œdematous process, a part of an œdema involving the gall-bladder and ducts or the cystic duct alone, or a portion of it may be involved, in which case it is usually the result of an infection, foreign bodies within the duct or other irritating processes.

6. *Tumors.*

C Extrinsic.

1. Angulations due to adhesions, constricting bands or displacement of the duct.

2. Pressure from tumors, enlarged glands, inflammatory or similar lesions.

II. Processes which harbor infection. A. Intrinsic.

Fig. 7. Fig. 8. Fig. 9. Fig. 10.

Fig. 7. Dilated mucous gland showing bifurcation.
Fig. 8. Markedly distended mucous gland adjacent to others showing but slight distention.
Fig. 9. Group of distended acini.
Fig. 10. Hypertrophy of the mucous glands.

1. Foreign bodies by interfering with the lumen, lowering the resistance through pressure or the formation of pockets which hold bile or the secretion of the mucosa or its glands, predispose to bacterial growth.

2. Obstructive lesions through producing a stasis predispose not only to bacterial growth but also to the extension of the bacteria to the gall-bladder.

3. Villous growths. The mucosa of the cystic duct like that of the gall-bladder shows a predisposition to a fine villous growth in the presence of chronic irritation. The villi have a delicate connective-tissue framework containing tiny blood-vessels and are covered with columnar epithelium. They do not grow as large as those in the gall-bladder, are not so numerous, and do not anastomose so freely. They are not large enough to interfere with the lumen but may harbor bacteria (Fig. 6).

4. Ulcers when present are a continuous source of infection.

B. Intramural.

1. The lesions of the mucous glands are the most important lesions in this class. They do not differ materially from those of the mucous glands of the gall-bladder, except that bile pigment, so far as I have been able to observe, is never found in them. The principal lesions are:

a. Simple infections within the glands. The lumen becomes distended with an accumulation of desquamated epithelium, pus cells, bacteria, and mucus.

b. Periglandulitis. This is an advanced stage of the former and in addition to the above findings there is a round cell infiltration, œdema and congestion about the glands.

c. Intramural abscess. In the presence of an intense infection or when there is not free drainage in milder infections breaking down and abscess formation may occur. They may be single or multiple. After abscess formation has taken place the duct of the gland may open and the abscess discharge into the lumen of the cystic duct, the abscess may rupture either externally or internally or the process may go on to resolution.

d. Perforation as mentioned above may take place either into the duct or into the lesser omentum or into the peritoneal cavity.

e. Chronic infection. The gland becomes more or less distended with detached and broken down epithelium, pus cells, bacteria and mucus. About the duct is a round cell infiltration. The duct may remain open or open intermittently, discharging its contents, including bacteria, into the cystic duct. In case the duct becomes permanently closed it may heal, the infection may become latent, an intramural abscess may develop or there may be distention due to retained secretions.

f. Intramural cysts. Distention of the glands may occasionally be due to back-pressure but it is usually the result of the obstruction of the duct with the retention of the secretions, for otherwise bile pigment would be found in the cysts (Fig. 7, 8, and 9).

g. Adenoma. I have seen marked hypertrophy of the glands, but none to such an extent that the term adenoma could be applied to it, yet I believe it is possible that they do occur (Fig. 10).

h. Primary carcinoma. I have not observed any up to the present.

CLINICAL SIGNIFICANCE

Clinically the obstructive lesions can best be classified according as they produce permanent complete obstruction, transitory complete obstruction, permanent partial obstruction or transitory partial obstruction.

In the obstructions the involvement of the gall-bladder may completely overshadow the cystic duct clinically. The following conditions have been observed as the result of such obstruction: acute and chronic cholecystitis, hydrops, empyema, sclerosis and calcification. The latter two occur only with the permanent complete obstruction while the former three occur with any form of obstruction, but more often probably with the transitory types especially those resulting from foreign bodies.

Excluding the symptoms that come from the gall-bladder involvement, with permanent complete obstruction, pain may be entirely absent and when present is usually dull and never colic-like. Tenderness is present.

The transitory complete obstruction, on the other hand, is usually accompanied by pain which may be colic-like at first, but if the condition persists without an occasional remission or when due to a stone and the stone does not pass on downward or becomes loosened, the pain soon loses its colic-like character. Infection is very frequently present.

Permanent partial obstruction is accompanied with tenderness and pain of a more or less dull character. There may be occasional attacks of colic-like pain. Hypertrophy of the muscle of the duct above the obstruction and of the gall-bladder occurs.

In transitory partial obstruction there is tenderness present and pain varying with the degree of obstruction. When the lumen is markedly encroached upon there may be a colic that cannot be distinguished from gall-stone colic, regardless of what may be the cause. It is produced by the intense muscular contractions that are attempting to force the contents of the duct or gall-bladder or both by the obstruction. This condition is often accompanied by more or less infection.

Obstructive lesions by forming pockets or otherwise causing retention harbor infective organisms and thus predispose to infection of the rest of the biliary tract or through the blood stream elsewhere in the body.

The glands of the cystic duct become of importance clinically, first when they become infected: (a) By discharging organisms into the duct which may pass upward with the bile into the gall-bladder or downward into the common duct, whence they may ascend to the liver;

b. By acting as a focus whence organisms may go into the blood stream.

c. By perforation into the lesser omentum or peritoneal cavity and thus there may result an abscess in the former case or a peritonitis, local or general, in the latter.

d. Through the action of the toxin absorbed.

Second, when they become distended and encroach upon the lumen of the duct.

The positive diagnosis of lesions of the cystic duct will rarely be made clinically or with the exception of stones or other masses, upon gross examination. In the majority of cases the microscope will be required.

The clinical indications are for cholecystectomy. Drainage will relieve secondary lesions but it would not have any influence upon permanent strictures, could not guarantee that transitory strictures might not return and in the case of infected glands there would be but little influence upon the deeper portions.

NOTES ON TWO SIGNS IN CHRONIC APPENDICITIS[1]

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ONE of the most frequent visitors to the doctor's office is the patient with indefinite pain of transitory character belonging to the right side of the abdomen. If the patient consults the surgeon the latter is prone to find symptoms of chronic appendicitis and he sometimes alarms the patient with a prognosis of impending disaster if the appendix is not removed. When this same patient enters the office of the internist with the appendix in the form of a question mark, the internist is prone to treat the matter lightly and to say that the pain is caused by gas in the cæcum and ascending colon, a condition which is recognized readily on percussion of the abdominal wall. The greater number of these patients belong to the neurasthenic group; patients with stigmata of decline presenting objective signs in stigmata of arrested development of various structures of the body. The appendix vermiformis, as a vestigial structure with a tendency to undergo involution changes of its various coats, appears to undergo involution earlier in patients of the neurotic group. Involution changes which normally might become marked in the average individual at perhaps fifty years of age may appear in the patient with stigmata of decline at the twenty-fifth year of age. The appendix undergoing involution change with connective-tissue replacement of its coats becomes a source of irritation to the ganglia of the autonomic and sympathetic nervous system. Nerve elements remain in such an appendix until practically all other structures have disappeared and these nerve elements are irritated by the contracting of hyperplastic connective tissue. Irritation calls for a special determination of blood supply to that point, and the control of the blood supply belongs in the domain of sympathetic nerve function. When the message from the irritated appendix is registered for a sufficiently long time upon the ganglia relating to the cæcum and the ascending colon, the muscular coats of the cæcum and the ascending colon eventually become exhausted. This part of the bowel then becomes more or less permanently distended with gas and gives us an important differential diagnostic sign belonging to chronic appendicitis but not to acute appendicitis. I call it the cider barrel sign for the purpose of making a picture, because percussion upon the normal left side of the abdomen elicits a note suggestive of a cider barrel in October, while percussion over the distended bowel on the right side brings out a note suggestive of the cider barrel in March.

Another sign belonging to chronic appendicitis and not to acute appendicitis relates also to sympathetic nerve ganglia, apparently due to persistent registering of impulses. It is not unlikely that the impulse extends in an afferent way to a segment of the spinal cord and then proceeds efferently to one ganglionic point and at the same time to the skin in the zone described by Head as belonging to the appendix. The ganglionic point apparently relates to what anatomists sometimes now speak of "as the fused ganglion" consisting of the second and third right lumbar sympathetic ganglia. Hyperæsthesia of the fused ganglion will be in evidence if we make pressure deeply and slowly upon the patient's abdominal wall about an inch and a half to the right of the navel and a trifle caudad. When we find this tender point distinctly in evidence and standing alone without tenderness of the left lumbar ganglia there appears to be definite evidence that we are dealing with the appendix as the source of trouble.

Chronic appendicitis relates most frequently to an irritative lesion rather than to an infective lesion. It belongs most often to that irritation of nerve elements by the contracting connective tissue which belongs to involution change. The irritative feature, however, may belong to ordinary scar tissue which has followed an infective involution of the appendix. In chronic appendicitis cases the two signs here described appear to have distinct diagnostic value. When the source of the

[1]Read before the meeting of the Southern Surgical Association. Baltimore, December 17, 1918.

irritation is in the vicinity of the pylorus or gall-bladder we find Mayo-Robson's tender point relating to the first sympathetic lumbar ganglion on the right side. When the sympathetic lumbar ganglia of both right and left sides are found to be tender on pressure we may look to the pelvis for the source of irritation. The pelvic ganglia receive and distribute impulses over such a large area that a chronic source of disturbance in the pelvis seems to be registered upon both right and left sympathetic lumbar ganglia instead of on the ganglionic point on the right side belonging to the appendix.

CONGENITAL DIVERTICULA OF THE INTESTINES

Report of A Case of a Tumor Growing from the Tip of an Apparently Congenital Diverticulum in the Lower Sigmoid Region[1]

By WILLIAM T. BLACK, M.D., F.A.C.S., Memphis, Tennessee

THE vitelline duct, which is attached to the ileum, should disappear between the sixth and seventh weeks of intrauterine life. At this time it should change from a tube to a cord, which in turn melts away, leaving the bowels free from their connection to the umbilicus. When the cord remains we have a diverticulum. Diverticula are either congenital or acquired. This paper deals only with the congenital or inherited type. A true diverticulum is the remains of the vitelline or omphalomesenteric duct, that is its intra-abdominal portion. Lavata, in 1671, was probably the first to call attention to the diverticulum, and later Ruysch described it more accurately. It remained for Meckel, by whose name the diverticulum is named, to give to the world its true pathological and surgical significance. The acquired types have assumed their importance, both from a pathological and a surgical view point, and have been elaborated upon by many able writers, and will not be discussed in this report. Meckel's diverticulum is estimated to be present in about 2 per cent of people. It varies in length from 1 to 20 centimeters, and may be found from 30 to 290 centimeters (the average distance being 100 centimeters) above the ileocæcal valve (in the child the distance is less) where the yolk stalk is attached. In cases where the lower limb of the primitive intestinal loop has undergone excessive development, it may be found in the cæcum or colon.[1] At times it remains patent throughout, and there may be present fæcal matter exuding from the umbilicus, or it may be closed on the intestinal side and open at the umbilicus, but usually, however, the distal end is closed and the proximal end open. It varies in size from a very small cord-like structure to one as large, or even larger, than the lumen of the gut. There may be smaller false diverticula connected with a true diverticulum. It may be bulbous at its distal extremity and narrow at its intestinal end.

Both extremities may be occluded and patulous in the center. Sometimes there remains only a fibrous cord and at times only blood-vessels. It usually arises from the convex side of the gut, but may spring from the mesenteric side, and may have a mesentery of its own. Wellington says that in about one-third of the cases it is attached to the umbilicus, or adherent to some other part of the anatomy.

A pre-operative diagnosis of the presence of a diverticulum cannot be positively made. A probable diagnosis may be made in those with a fæcal discharge at the umbilicus. A discharge of any kind at the umbilicus, with a sinus or a growth, present is suggestive. Especially is this true in children, where the child is afflicted with gastro-intestinal symptoms. Right-sided abdominal pain, which continues or follows the removal of the appendix, after a

[1] Binnie's Surgery, 1917.

[1] Read before the Southern Surgical Association, Baltimore, December 17-19, 1918.

careful inspection of other organs, which are found to be normal, is suggestive to a certain extent (if adhesions can be ruled out) of a diseased diverticulum. The X-ray may assist in a pre-operative diagnosis.

Mumford estimates that 13 per cent of the diverticula become inflamed or diseased. The principal danger then lies in these 13 per cent of cases, for we all know the frequent occurrence of intestinal obstruction produced by a diverticulum. In 22 cases at the St. Thomas Hospital from 1887 to 1908, 63 or 6 per cent died — a mortality of 1 per cent higher than that from all other sources (including cancer). Hilgenreiner's report of 102 collected cases in 1902, shows a mortality of 71.5 per cent. Murphy stated that 5 or 6 per cent of intestinal obstructions were due to diverticula. The majority of people who possess diverticula are without symptoms. Diseased diverticula will produce symptoms in proportion to the extent of the pathology present. Symptoms simulating an acute or chronic appendix may be present. The symptoms of obstruction or symptoms due to growths, which spring from them, give the usual symptoms of such conditions.

The following patient came under my service at the Baptist Memorial Hospital, in October, 1918:

Mrs. Mary S., age 59; white; female; American; did housework and work in the field. Her family history is negative. She denies previous history of syphilis, cancer, tuberculosis, insanity, etc. She had the usual diseases of childhood. The patient married at the age of 14. Her physical and mental appearance is fair. The patient began four years ago to have pain in right iliac region, sharp and shooting in character. This was not accompanied by any gastro-intestinal disturbances. The pain subsided in about three weeks. Some time later she discovered a lump in her abdomen, which was movable but not accompanied by pain. The tumor did not disable the patient in any way, causing only slight discomfort and constipation. The abdomen commenced to enlarge about two years ago, and has continued to enlarge ever since. The abdomen was largest on the left side. The tumor seemed to stay the same size for 12 or 15 months, then began to enlarge rapidly, with symptoms of bearing down pain in pelvis, and backache, dyspnœa, etc.

The patient first menstruated at 14 years; regular, 28-day type, 4 or 5 days' duration, quantity of flow normal. The menopause occurred at the age of 50.

The patient is the mother of eight children, the oldest 44 years old, the youngest 17. Her labors were normal. She was not attended by a physician during any of her labors. She had one premature labor at eight months. No complication or sequelæ followed any of her confinements. She has no leucorrhœa; she is constipated, micturition has been frequent for past few months. She suffers from indigestion of late. Nervous symptoms are negative. Previous treatment—medical.

Physical examination shows a well-developed, poorly-nourished woman. She has lost several pounds in weight during the past few months. The skin is jaundiced and wrinkled. The eyes are normal, the teeth bad, and the breath foul.

Thoracic cavity negative. Blood pressure: systolic, 155; diastolic, 110. The abdomen is distended to about the size of a nine months' pregnancy. A tumor hard and irregular in outline, except on the upper, right side, fluctuates on palpation. Flatness is noticeable over the entire abdomen, except that a tympanitic note is present over the colon. There is no area of tenderness. The spleen and kidneys are not palpable. The liver is normal. Except for slight emaciation, the extremities are normal. Urinalysis negative.

Blood count: leucocytes, 6,800; reds, 4,048,000; polymorphonuclears, 80 per cent; small lymphocytes, 12 per cent; large lymphocytes, 4 per cent; eosmophiles, 2 per cent.

Wassermann test negative.

The general appearance of vulva is normal. There is a slight leucorrhœal discharge. The perineum is negative. The cervix is pushed up under the pubic region. The uterus is pushed forward. The appendages are not palpable. A large mass is present.

A pre-operative diagnosis of either a large subserous myomata with cystic degeneration or an ovarian tumor was made. The patient was operated upon on October 4, 1918, under ether anæsthesia. A median abdominal incision was made from the pubes extending up nearly to the ensiform cartilage. A large, irregular, cauliflower-shaped tumor, filling the entire pelvic and abdominal cavities was found. The tumor showed marked cystic degeneration. No free abdominal fluid was present. Weight of tumor, 4,260 grams.

There were two large cysts at the upper right portion, each about the size of a large grape fruit, filled with chocolate-colored fluid. The tumor was entirely free, not connected with any structure, except at its origin. However, in one place, one cyst was adherent to the anterior abdominal parietal peritoneum, just below and to the right of the umbilicus. The adherence of the cyst to the peritoneum was loosened, and the mass lifted out of the abdominal cavity. The origin of the tumor sprang from the tip end of a diverticulum. The diverticulum had its origin in the lower portion of the sigmoid (rectosigmoid region). It sprang from the convex side of the gut. There was no mesentery on the diverticulum. It was about 11 centimeters in length

Fig. 1. Rough sketch showing attachment of tumor to diverticulum.

and about the size of the little finger. The diverticulum was caught with two clamps and cut. A probe was pushed through the diverticulum to the gut to confirm its character. A purse-string suture was passed around the gut end, and the stump was treated as the stump of an appendix is usually treated. I was surprised to find such an origin, as I expected to find the origin of the tumor coming either from the ovary or the uterus. There was not an adhesion to any abdominal or pelvic structure, except where the cyst was attached. The uterus and appendages were normal. This mass had every appearance of springing from only the endothelial side of the intestine (diverticulum). I noticed particularly the absence of large blood-vessels running through the diverticulum, as one would expect to find in so large a tumor. There was a small mass in the hilum of the spleen. There was no evidence of metastasis in any other organ.

The following is the pathological report on the specimen sent by Dr. H. T. Brooks, professor of pathology, at the University of Tennessee:

The specimen, as a whole, would probably fill a one and one-half to two gallon bucket. The external surface showed many small, and a few large, papillary projections. Here and there were large and small fluctuating masses indicating the presence of cysts. Everywhere the tumor had a markedly gelatinous appearance. Sections through the tumor showed cysts of varying sizes; one holding a pint or more of fluid. The fluid was brownish in color. The contents of the cyst showed no mucin.

Microscopical examination of the six different areas of the tumor showed several layers of epithelial cells, with no indication of downgrowth into the stroma. The several layers of cells, however, point to a malignancy. The stroma everywhere showed extensive myxomatous changes and this accounts for the gelatinous appearance of the tumor. (It was my impression at first sight of gross inspection, that it was due to a mucous degeneration on the part of the epithelial cells. This, however, was incorrect.)

Diagnosis: malignant cystadenoma, the stroma of which has undergone an extensive myxomatous change.

The following is the report from the Pathological Laboratory of Dr. William Krauss, Memphis, Tennessee:

First report. Examination of specimen submitted shows bad fixation. Such tissue is apt to be autolytic and consequently indistinct. Two areas have been picked out. The most developed cells have the characteristics of the fibroblasts from endothelia. The younger ones sometimes in islands are normal and rather small, but evidently purely endothelial cells. The stroma is myxoid. I regard it as myxoma, springing from the serosa and preserving some of the characteristics of endothelial origin. This report was based on small sections of tumor sent to him.

Second report. The following is the report upon the tumor mass submitted to me after I had reported on the sections made from smaller pieces.

The entire mass impregnated with formaldehyde weighed 1420 grams, about three pounds. It is bluish white in color, translucent, very lobulated, with numerous fine cauliflower exuberances. Many of the warty masses are cystic. Some of the cysts are imperfectly formed, the tissues gradually merging into a mucoid material. The larger, older cysts

are smooth walled with patches of cauliflower protruding into them. These contain clear serous fluid, and remind one of papillary ovarian cystoma.

Microscopically the stroma is partly fibrous and partly mucoid with islands of proliferating endothelia, often seen to connect with spaces that have a very primitive structure and lined by round and oval cells with vesicular nuclei. Fixation, however, is not good. The covering of the entire polypoid mass is very scanty, and shows thickening only in a few places. The stroma is the only active tissue, and the blood supply is exceedingly scanty.

Diagnosis: Fibromucous peritoneal polyp. Although the gross resemblance to an ovarian tumor is striking, there is nothing in the histology to suggest any ovarian origin.

(The above were specimens obtained by Dr. William Krauss, from about one-third of the tumor, which was sent to him.)

The following report was given by Dr. W. G. MacCallum, of the Johns Hopkins University:

The specimen appears to me to be a papillomatous growth composed of very loose and œdematous stroma, rather more dense near the surface, and forming large round papillary masses. It is in protected places, covered with a layer of epithelium, which is in places cylindrical, although usually cubical or flattened. In exposed places the epithelium is rubbed off, and the superficial layer of the stroma appears as though the basement membrane had been lifted off by a fluid.

There was a wall on both sides of which the papillary masses seemed to project, but the sections do not show this; probably those cut deeper in the block will do so. I enclose three sections.

From the above reports the tumor is evidently potentially a malignant type. The tumor was in the stage of regression, which probably was due to a poor blood supply. There were no vessels of any size in the diverticulum, and the growth probably received its principal sustenance from the peritoneal fluid. Unless the small mass in the hilum of the spleen was a coincidence, then one would naturally think the tumor was a malignant one and this a metastatic growth. I am unable to account for such a mass as this growing from only the outer coat of the diverticulum. If it was a malignant tumor, I am unable to find an exciting cause. It is improbable to suppose that peristalsis, or the movements of the other viscera, could produce any irritation. It is possible that, when the patient had the severe pain in her abdomen four years ago, she had a diverticulitis, or that an ulceration might have been produced from within, which extended to the outer portion of the diverticulum, or what probably occurred was a perforation. The formation of a malignant growth can at times be accounted for by the retention of hardened fæcal matter, or concretions acting as a predisposing or exciting cause. The retention of dry fæcal matter, or foreign bodies in this location, is favored by a constriction at the sigmoidorectal portion. We have in the lower sigmoid, in the embryological stage a dilated or pouch-like condition present. This dilatation may continue in the adult as an embryonal defect, which might further assist in the retention of fæcal matter. This dilatation might have been the source of the diverticulum. Strictures, or growths of the rectum, hæmorrhoids or any inflammatory process involving the rectum would naturally resist the proper expulsion of the intestinal contents. Too long retention of this fæcal matter or concretions, might in a certain percentage of cases produce an erosion or ulceration, which might act as a starting point of a precancerous lesion. The same might apply to a diverticulum in this region.

In the case reported, however, there was no hardened fæcal matter, or foreign bodies, present, and the diverticulum and sigmoid were macroscopically normal everywhere, (except at the attachment of the growth). The principal etiological factors can best be explained through an embryological condition or fœtal rest, or transplantation of tissue from some other organ, or started as an inflammatory process. I am unable to find in the literature, at my disposal, a description of a similar case. Doubtless, however, other cases have been observed and recorded of a like character. A congenital diverticulum is unusual in this portion of the gut, and can only be accounted for through an error in embryological development.

Bizé in 1904, Devé in 1906, Denuicé in 1908, report cases of small pancreatic tissues, growing from the tip end of Meckel's diverticulum. Colmers in 1906 published an article upon intestinal cysts and their treatment. He says: "Raesfeld was the first to describe

an enterocystoma, and that he drew attention to the fact that it developed from a Meckel's diverticulum" — (Cullen).

Cullen, Cowardine, Rimbach, Roth, Tideman, Colmers and others have reported cystic tumors connected with the remains of the omphalomesenteric structure. In Rimbach's case, the tumor was as large as a man's head and adherent to the omentum.

Most of the reported cases have been small tumors, usually cystic and connected with Meckel's diverticulum in the iliac portion of the intestinal tract, or at the umbilicus. Mayo reports the rupture of a sigmoid diverticulum, which was thought to be congenital in type, forming an abscess in the pelvis. Cases of carcinoma are reported where a diverticulum is involved secondarily by contiguity of tissue. The treatment of an inherited diverticulum depends upon whether the organ is diseased, upon its location and upon its structure and size. All diseased diverticula, when attached to some other structure at its distal end, should be removed. Those with small proximal openings, and all found in the large gut (where solid fæces are found) should be removed. When the vitelline duct remains as a cord, or set of blood-vessels, it should be excised. Large normal diverticula, discovered accidentally in the small intestine (where we have only liquid fæces), should be left alone, for the fear of increasing mortality.

CONCLUSION

This tumor was connected only to the serosa side of the diverticulum. Potentially it was a malignant growth. A diverticulitis, or perforation, could be assigned as a predisposing or exciting cause, although it could be attributed to a fœtal inclusion. This diverticulum had the characteristics of a congenital type, but it is possible for it to be of the acquired type. Unless one can palpate the uterus and ovaries, a differential diagnosis cannot be made between a uterine myomata, with a pedicle, or an ovarian tumor, and a tumor growing from a diverticulum in the lower sigmoid region.

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WAR AMPUTATIONS

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THE Interallied Surgical Conference at its meeting in 1917 came to the following conclusions in regard to the subject of amputations.

"Primary amputations or those delayed 24 or 48 hours will be made as nearly as possible at the site of fracture by simple section of the soft parts or with slight trimming of the bone; in less grave cases the amputation will be made as near as possible to the level of the fracture.

"Amputation for infection will be made by simple cross section or with very short flaps fixed in eversion. The stump will be regularized, if this is necessary, when the wound is disinfected and when all possible extension of the soft parts has been obtained.

"The technique in cases of retarded amputation will be governed chiefly by the indications of prosthesis.

"In cases of fissured fractures extending very high the fissured fragment may be preserved but disinfection of the wound must be practiced."

For years the dominating idea in determining the surgical procedure of amputations has been to obtain a stump able to bear weight upon its end. The various osteoplastic methods which have been introduced are witness to this fact. Surgeons generally have had the impression that no satisfactory prosthesis could be applied, for example, to the leg in the absence of the ability of that stump to bear pressure upon its end. This impression is erroneus. Up to the present, end-weight bearing ability when present, except in the comparatively rare cases of Syme's amputations and disarticulations of the knee or hip, has been almost altogether disregarded by artificial limb manufacturers. In cases of thigh amputation the principal support is taken upon the tuberosity of the ischium with secondary support upon the soft parts of the stump; in amputations below the knee upon the shelving under surface of the plateau of the tibia. Cases provided with apparatus in this manner walk extremely well without any bearing whatever upon the end of the stump.

This does not mean to say that end-weight-bearing is not desirable. It should be developed and used whenever possible. The work of Hirsh and Lisle has shown that this ability is largely a matter of treatment and that it can be developed in a large percentage of stumps by the systematic use of end-pressing exercises or end-pounding during convalescence.

In general, however successful, end-weight-bearing demands certain qualities of the stump itself such as good covering for the end of the bone, mobile non-adherent flaps, absence of terminal scars, and mobility of the scar. In order to obtain these, infection and aseptic healing are essential. In war wounds primary healing, even when the amputation has been made well above the level of the lesion and the wound sutured is exceptional; generally the stump becomes badly infected or distended with gas and opening of the flaps or reamputation becomes necessary. In this way the desired end has been defeated and yet there has been a needless sacrifice in the length of the stump.

A stump is above all things a lever and its most important asset is length. Valuable as end-bearing power may be when properly put to use, it is small in importance when compared with length. As between the method of operation which will save to the patient the maximum length of stump and another which will shorten the bone in order to obtain end bearing, at the most problematical, the choice should go without doubt to the former.

The only way to judge amputation cases is by the result obtained when the stump is fitted with prosthetic appliances. From this standpoint there can be no question that the best results are secured in those cases where the operator abandons the classical methods

and attempts to save the maximum length by section at the level of the wound while at the same time making provision for dealing with the omnipresent infection by leaving the wound wide open. The care of creating a sound, useful stump is left to a secondary surgical intervention. Many of the resulting stumps fail to meet our old definitions of what constituted healthy stumps and some demand still further surgical treatment, but as a whole the gain has been great because there has been a general saving in length. Examination of three hundred amputated French soldiers, six months or more after healing of their wounds, showed only 20 per cent with what might be considered as classical stumps. Seventy per cent had terminal scars, which were adherent to the bone in 50 per cent. The end of the bone was protruding under the skin in 20 per cent. Practically all of these cases were wearing artificial limbs, usually of a poor type, and in spite of it they uniformly walked well.

The tendency of distinguished allied surgeons during the past year has been more and more in the direction of ceasing to regard amputations as a special group of cases requiring a special operative technique and instead to class them with all other war wounds and amenable to exactly the same rules of surgical procedure.

The limb is divided at the level of the lesion. The contused and injured or infected tissues are excised and when it is possible to obtain sound short flaps from in front of or behind the missile tract these are preserved but packed wide apart. Long flaps are usually dangerous as they tend to fall together, despite care, and interfere with drainage.

The treatment of the end of the bone is variable and depends upon conditions and the probability of remaining infection. Where it has been possible to do thorough excision of all damaged or infected tissue all projecting bone may be removed, but when it is probable that infection will develop it is better to leave the bone long and postpone the shortening of it to the secondary operation. It is fairly certain that the aperiosteal method of dealing with the end of the bone gives the best results. Formation of osteophytes around the end of the bone in war amputation stumps has been extremely common. This is probably due in large measure to the shredding of the periosteum preparatory to sawing the bone. With care this may be prevented and with a curette the periosteum is removed on a surface of one-quarter inch above the level of the section. Similarly the medulla of the bone should be curetted for about the same distance. In the absence of infection with this method, the end of the bone becomes more or less absorbed and rounded and the formation of osteophytes is minimized.

The vessels should be ligated with as little dissection as possible. It does not matter if they project upon the surface of the wound. The treatment of the nerve ends demands special care. A good method is to draw down upon the nerve, separate and peel back its sheath and divide it as high as possible by a wedge-shaped or fish-tailed incision. The end of the sheath is then drawn down and ligated. Formation of neuromata and painful nerve endings are avoided in a very large percentage of cases treated in this manner.

In a certain number of primary amputations, the stumps so prepared may be closed by delayed primary suture similarly to other war wounds and subject to the same criteria; that is, bacteriological investigation and clinical appearance. The probability of this procedure may be estimated fairly well at the time of the primary operation and in that case the operation itself, the preparation of flaps, etc., will be governed accordingly.

Where delayed primary union is not possible or when infection is expected, progressive sterilization of the wound should be practiced. In this connection the method of applying the Carrel tubes that is in use at La Panne is of value. To square pieces of gauze corresponding in size to the cross section area of amputation stumps, at various levels are stitched Carrel tubes in the position and proximity desired. These are prepared beforehand and sterilized. They are applied directly to the wound and afford a sure manner of holding the tubes in place. The troublesome slipping and change in position of the tubes is thus avoided, and by using 8 to 12

tubes, effective distribution of the disinfectant is obtained.

The application of extension to the skin of the stump has proved of great value and its more general use would be desirable. This is particularly advisable in thigh and upper arm cases. The amount of retraction of muscles and skin which occurs is often remarkable. In thigh stumps particularly even quite long flaps apparently disappear totally in the course of two or three days. Such a wound may then appear as almost a plane surface. The application of traction will, however, make these flaps reappear. Needless sacrifice of length in many stumps may be saved by its more general use. Where traction tends to close the wound it cannot be successfully used when infection is present. This cannot happen when the flapless method of amputation has been used. In this case the use of traction tends mechanically to favor wound disinfection as the surface remains a plane section instead of becoming conical as retraction occurs.

Traction may be applied either by means of a pulley and weight or by using a modified Thomas splint. Each method has its advantages. The extension splint is best adapted for use at the front as it is more compact and can be used for transportation, whereas the method with the pulley and weight is best suited to the needs of the base hospital.

The splint is a modification of the ordinary Thomas Ring apparatus used for fracture cases. It is shorter and the side bars instead of being parallel are divergent. At the foot end is fastened a square upright frame which serves at the same time as a support for the apparatus and a point of attachment for the extension. The stump is supported on flannel strips fastened to the side bars in the ordinary manner. The traction may be applied either by strips of adhesive plaster or by flannel strips and glue. These are fastened to the skin two inches above the wound and run the entire length of the stump. The number of these to be used and their arrangement depend upon the shape of the wound and the level of the amputation. The ends of the strips are fastened to a steel ring larger in diameter than the end of the stump. The ring is important because it prevents pressure upon the wound edges and also equalizes the pull. It has two lateral projections which rest upon the side bars of the frame. It is fastened to the end piece either by coiled steel wire springs or rubber tubing which gives the necessary traction pull. Change of dressing is very easy as the traction bands are simply unhooked from the ring and the latter passed upward over the end of the stump giving an unobstructed view of the wound. This splint immobilizes the stump completely and is very comfortable for the patient.

When the pulley and weight method is used the splint is unnecessary. The ring is retained as it simplifies dressings, but the traction is furnished by a cord and weight, the latter from 3 to 6 pounds, depending upon how much the patient can stand. The comfort of the patient is much increased if the stump is supported upon a swath the ends of which are fastened to short steel bars suspended by cords from an overhead pulley and counter balanced by weights. When arranged in this manner the patient can lift himself easily and move about in bed and nursing is simplified.

It is exceedingly important with any apparatus that tends to elevate the stump to guard against the contracture of certain muscle groups with resulting limitation of joint motion. One of the most frequent causes of failure to develop the maximum benefit from the prosthetic appliances in amputation cases is this limitation of the full range of motion at the joint. Very few thigh cases retain their power of hyperextension at the stump and flexion contractures are the rule; below the knee limitation of extension; in the forearm loss of supination; in the upper arm limitation of abduction are the other common impairments. Precisely those motions are limited which are most necessary to the welfare of the cripple. They are often due to prolonged immobilization of the stumps in bad position and can in large measure be prevented. Systematically each day beginning after operation the stump must be made passively to execute in its entirety the motion that is most likely to be affected.

For thigh cases who are too ill to turn over on their faces for the purpose of making hyperextension of the stump another maneuver is substituted. With the patient lying flat on his back, a pillow is introduced under the buttocks to elevate the hips. The sound leg is then fully flexed on the abdomen to tilt and fix the pelvis. The stump will be found pointing in the air and it suffices to move this backward as far as possible while at the same time the crests of the ilia are held down by the nurse effectively to guard against flexion contracture. In cases of amputation of the leg, the knee should be fully flexed and extended. In amputations of the upper arm the stump should be abducted completely each day. Its maintenance in the abducted position by means of the special traction splint is also advisable and the passive exercise of the stump is then not necessary. Similarly care should be exercised in stumps of the forearm to put them through the normal range of supination and pronation. These simple exercises require very little time and trouble. The traction splint when used does not need to be removed. By removing the flannel supports the stump can be moved inside the splint.

Almost all amputation stumps require secondary operations for closure of the wound. Delayed primary union at the end of 3 to 5 days has already been mentioned and should be done in all cases where bacteriological study justifies it. Secondary suture may be done when progressive chemical disinfection of the wound is successful. In a certain proportion of cases, however, infection of the bone occurs and the bacteria become inaccessible to the solution. In these cases a simple bone shortening operation with excision of a wedge-shaped section of the soft parts may be done. The wound should be left open and it may be possible to obtain chemical sterilization and secondary suture. Even when this is unsuccessful the wound will granulate and close by epithelization in most cases. This may take time, but conservatism pays.

A certain number of the resulting stumps prove unsuitable for satisfactory use on account of protruding bone adherent to the scar, sinus formation and chronic osteomyelitis, troublesome osteophytes or painful nerve endings. Each of these conditions demands appropriate surgical treatment, but as a rule this should not be carried out until the lapse of a certain time and when more conservative measures have failed. The excision of an adherent scar with shortening of the bone in an apparently clean case may let loose dormant or encapsulated bacteria and produce reinfection. The extrusion of a sequestrum by natural means may occur after a little time and result in closure of a sinus. Perfection is difficult to obtain and should not be sought for; very often it will bring disaster.

Immediately that a stump is able to tolerate pressure on its end, steps should be taken to develop its end-weightbearing possibilities by inaugurating end-pressure exercises. The degree of pressure borne by the stump is graduated and in no case exceeds that which the patient can stand. The stump is first pressed against a box covered by a pillow resting against the foot of the bed. This is done at regular intervals during the day. Later as the end of the stump becomes toughened, the pressure exerted is increased. In the standing position, the stump is pressed against the seat of a chair at frequent intervals during the day. The force is increased until the patient is actually pounding the end of his stump against it. Care must be used in inaugurating and supervising this exercise as it often causes infection to flare up. For this reason it should not be used in cases where sinuses are present. Unfortunately the exclusion of this class of cases makes the number to whom this procedure can actually be applied comparatively small.

Massage of the muscles actuating the stump is of great value in keeping up their nutrition, and in preventing degenerative changes from prolonged disuse.

Long-continued disuse is one of the most potent factors of all in preventing complete functional restoration in cases of amputation. This has been due in large measure in the past to the improper recognition of the necessity of supplying prosthetic apparatus at an early date. It is now possible to secure cheap,

light, provisional apparatus which can be applied immediately the patient is convalescent. Its use prevents the formation of the crutch habit, hastens stump shrinkage, and at the same time provides an invaluable means for active mobilization and muscle exercise. Its early application is imperative. Surgery must devote itself to shortening the period between amputation and convalescence, if we are to secure the best results. The earlier our wounded can be made ready for provisional prosthesis, the greater will be the degree of functional restoration obtained.

SYPHILITIC INDURATION OF THE VULVA

With Report of Four Cases

By J. F. GALLAGHER, M.D., F.A.C.S., Nashville, Tennessee

TO a large group of cases presenting the symptom-complex of chronic enlargement of a part with smooth or roughened skin, with or without ulceration, and microscopically characterized by increased connective-tissue formation with lymphatic dilatation (or new-growth), the term elephantiasis has been applied. This all-inclusive and meaningless term has been used to include this condition whether the underlying etiological factor would appear to be antenatal, as referred to by J. Schnitzler (1); mechanical obstruction by the removal of the lymph nodes draining the part, mentioned by Ravogli (2) and many others; recurrent streptococcic infections alluded to by Hill (3); tuberculosis, cited by Viatte (4); syphilis, referred to by Lena Kurz (5), Kelly (6), Ravogli (7), and many others; or the so-called tropical form due to the filaria sanguinis hominis (8), or the bilharzia.

Just seventy years ago Huguier (9) applied the term esthiomene to this condition when involving the vulvo-anal region, but neither he nor subsequent writers have made it clear just what is the underlying etiological factor in the condition they term esthiomene. Stein and Heimann (10) report a case and quote another from Szasz, in which there was cyst formation, using the term esthiomene, in which the causative agent was not determined. Hyde (11), Taylor (12), and Lena Kurz (13) believe all esthiomenes manifestations of tertiary syphilis.

It will be seen then that the term elephantiasis is applied to a clinical manifestation that is constant only in a very general way either in macroscopic or microscopic appearance and having a most variable etiology. The same may be said of the term esthiomene, though its use is restricted in application to the vulva. It would seem logical, therefore, to restrict these terms to a condition that has a definite pathology and etiology, or so to qualify the terms as to give an adequate conception of the condition considered; or, perhaps, to discard the terms

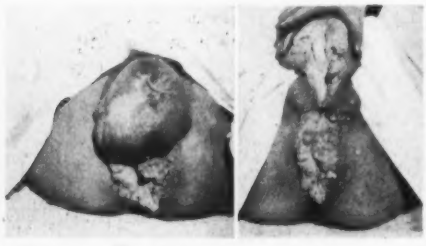

Fig. 1. Case 1.

Fig. 2. Case 2.

altogether. This latter I have done in applying the term "chronic syphilitic induration of the vulva" to the cases I shall report herewith. They are elephantiasic in gross appearance, they may be called esthiomenes, if that term is to be restricted to the cases in which syphilis is the causative factor, but they are syphilitic in origin, are chronic in their course, and their structure is of an indurative, œdematous type.

It is possible that what may be the largest percentage of cases that are termed esthiomene or elephantiasis vulvæ, have been considered of doubtful syphilitic origin because they are highly refractory to antisyphilitic treatment of whatever kind or intensity. Morover, the microscopic appearance of syphilitic and tuberculous lesions are often very confusing.

These cases came under observation in the Gynecological Out-Patient Department of Vanderbilt Medical School. Of the latest one thousand patients in that department, only six cases of syphilitic œdema of the vulva have been noted. Two of these were not very extensive, and only diagnosed clinically, and are omitted from this report.

CASE 1. Gussie C. A widowed, mulatto laundress of thirty, was seen first on November 11, 1917. She was born in Missouri.

The mother is living and well. The father died of cause unknown. One sister died of cause unknown. One sister living and well. She had 13 half-brothers and -sisters of whom she knows nothing.

The patient uses tobacco and alcohol. She had measles and chickenpox when a child, la grippe for four weeks, five years ago. She states she has had hæmorrhoids all her life and that she has pain and passes blood and mucus when her bowels move. Up to six days ago she got up two or three times at night to void. She often has burning on urination. No blood. Her menstrual history is entirely normal. She had a miscarriage at four months about ten years ago. The convalescence was uneventful. She denies venereal disease.

About four years ago she noticed a growth about the size of her thumb in the region of the clitoris. This has grown gradually to the present size. About seven or eight months ago she put raw bacon on the growth which caused it to ulcerate but this is now healed. At about the same time she noticed the growth about the anus. There is a burning sensation present at times, not associated with ulceration.

Physical examination shows the tonsils to be enlarged. There is a systolic murmur, almost entirely replacing the first sound, heard best at the apex. The epitrochlear and inguinal lymph nodes are palpable. There is a slight discharge from umbilicus, which is depressed. The margins are slightly hardened.

From the region of the clitoris and involving both nymphæ, a pedunculated tumor 12x15 centimeters is seen growing. On the right side of this tumor there is a small eroded surface about 4x2 centimeters. Extending from this forward is a scar. The labia majora are very much thickened, hard, not tender and have an appearance of pig skin. Covering the entire perineum and extending back to the coccyx on both sides of the anus is a huge cauliflower growth, red and having a very slight discharge. The urinary orifice is normal as are both walls of the vagina.

The urine is normal. The blood is normal save for a 4+ Wassermann.

CASE 2. Maggie McC. An unmarried negro domestic of nineteen first seen November 20, 1917. Born in Tennessee. The family history is unimportant. The patient had measles in childhood. She has lost about 30 pounds in weight in past year. She has had leucorrhœa for past three months. Periods entirely normal except that she has missed her last period. She has had no children, miscarriages, or abortions.

About eighteen months ago the patient noticed a small nodule on left side of vulva. In about three weeks this ulcerated but healed again in about two weeks. Later she noticed a swelling on the opposite side. These have grown gradually and continuously to present size. The patient states that the tumors swell, become hard and quite painful at night. Pain prevents her from sleeping.

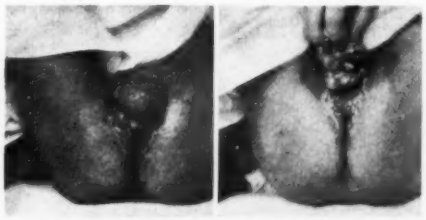

Fig. 3. Case 3.

Fig. 4. Case 4.

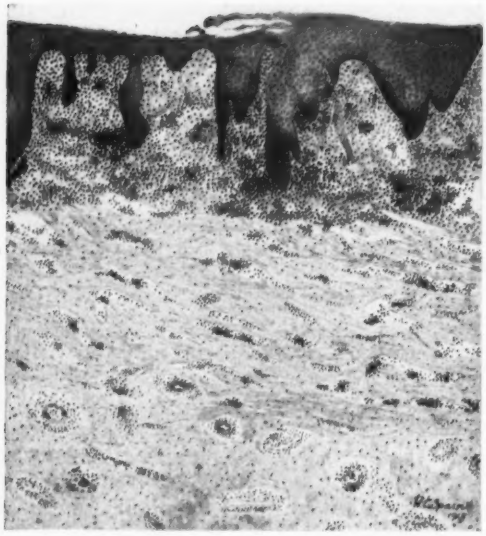

Fig. 5. Syphilitic induration of the vulva showing thickened epithelium, hyperplasis of the subepithelial connective tissue, with many new formed capillaries and many mononuclear lymphocytes.

Physical examination discloses an ulcerated area about the size of a dime on the hard palate. The lymph nodes are palpable in the inguinal region. Growing from and including the left labium is a rather soft, fluctuant not tender, tumor 12x8x6 centimeters. On the right labium is a similar mass 7x5x4 centimeters. On this mass is a small papillary mass which seems to have grown at the site of an old scar, Between the two masses and covering the labia minora, the vestibule and extending on to the perineum, is an ulcerating area covered with a foul, purulent discharge.

The urine and blood are negative. The Wassermann is negative.

Case 3. Mary P. Mulatto housewife of 32 first seen December 9, 1917. Born in Tennessee. The family history is unimportant. The patient had measles and whooping-cough in childhood. Thirteen years ago she had typhoid (?) fever. She had fever for one year and was sick two years. She has been unable to walk since that illness on account of contractures of flexors of toes and calf muscles. Menstruation has been normal except that lately the flow continues one day more and she has slight pain in the lower abdomen. She has had no children, miscarriages, or abortions. She has had leurorrhœa for 15 years. She denies venereal disease. She has lost no weight.

About two years ago the patient noticed an enlargement on upper part of privates. This grew slowly but steadily and in about six months she noticed an ulceration underneath. The growth has gradually increased in size. There is pain, of burning character, worse at night.

Physical examination discloses a patient who is poorly nourished. The inguinal lymph nodes are palpable. Both lower extremities are rather small. There is apparently the atrophy of disuse only. The ankle-joints are fixed in extension and the toes of both feet are markedly flexed. Knee-jerks are absent.

Growing from the region of the clitoris is a growth 5x7x10 centimeters. From the lower surface of this tumor and projecting toward the vagina are two smaller growths. Involving the entire perineum and extending out on to the inguinal folds is an ulcerating area with well-marked elevated edges which are undermined. This area is covered with a foul, purulent discharge.

The blood shows a 5+ Wassermann, otherwise negative. Urine negative.

Case 4. M. L. D. A negro "practical nurse" of 19, unmarried, was seen first February 15, 1918. Her father died of heart disease and she has an aunt who now has heart disease. The family history is otherwise negative. The patient had the diseases of childhood. For the past two months she has had a "heavy feeling" in stomach soon after eating. She has vomited several times during this time. Stomach symptoms are relieved by soda. She has a good appetite. She gets up two or three times at night to void. She denies venereal disease. Her periods began when patient was 18, they are regular, twenty-eight day type, flowing three days and using three napkins daily, moderately soiled. She has no pain. She has not menstruated during the past three months. She had had no children, miscarriages, or abortions, She had leucorrhœa for past 3½ years.

Three and one-half years ago the patient began to have a profuse vaginal discharge. In about one month a severe itching began in the perineum. This was followed by a sore which the patient believed was caused by scratching. The sore persisted and in about one year a swelling was noticed on the right side of vulva. During the past three months the left side has been enlarging. More recently a smaller tumor has appeared in the upper part of the vulva. Between these tumors and surrounding the anus an ulcer has been present since the beginning.

Physical examination. The patient looks older than age given. There is some œdema of the eyelids. The pupils are equally dilated, regular, but do not react to light and accommodation. There is an external squint in left eye; also nystagmus. There is marked deformity of front teeth. The liver is palpated one inch below the costal margin. There is a mottled appearance of skin below the knees. The postcervical, epitrochlear and inguinal lymph nodes are palpable. The reflexes are present but sluggish.

In the right labium is a tumor 10x6x4 centimeters. In the left labium one about half that size. From the

region of the clitoris another tumor 3x3x4 centimeters is seen. Beneath the tumors and extending out on the thighs and back around the anus an ulcerated area with elevated edges is seen. This extends into the vagina on the posterior wall. The vagina is constricted about one inch inside just admitting the fore finger. Rectal examination is so painful it is not attempted. The urine is normal. The blood shows a moderate leucocytosis of 12,000 and the Wassermann is 4+.

On removal all the tumors showed a marked tendency to bleed, the bases being very vascular. There seemed to be a marked arterial supply and a noticeable absence of veins. The tumor base had an almost characteristic pearly white appearance which exuded a clear serum on pressure. Histologically the specimens showed so striking a similarity in appearance that a description of one will suffice for all. Thickening of the surface epithelium with hypertrophy of the papillæ were the noticeable changes in the skin. Underneath these was a noticeable productive inflammation, lymphocytes, plasma cells and eosinophiles being present. Increased fibrous tissue with œdema and enlarged lymph spaces are noted which latter are infiltrated with lymphocytes and plasma cells. The blood-vessels show perivascular infiltration. There are giant cells but no caseous masses.

In the specimen removed from Case 3, A. A. Eggstein, of the Department of Pathology of Vanderbilt Medical School has demonstrated the presence of the spirochæta pallida. In a rather full but by no means complete survey of the literature I have not been able to find that this has been done before. Furthermore, Comyns Berkley (14) states that "up to the present time we find no cases recorded with spirochæta pallida in the tissues affected with esthiomene."

The treatment instituted was the complete removal of the growths with the sliding of skin flaps to cover denuded areas. The condylomatous or ulcerated areas were thoroughly cauterized with the actual cautery. Closure was effected by the use of interrupted silkworm-gut sutures. The after-treatment was vigorous antisyphilitic medication.

Cases 1, 3, and 4 were seen March 18, 1918.

Case 1 showed, four months after operation, although she had discontinued the antisyphilitic medication which was administered during her sixteen days in the hospital, a complete healing and a fairly normal vulva. The condylomatous growth was smaller; no raw surfaces nor any discharge.

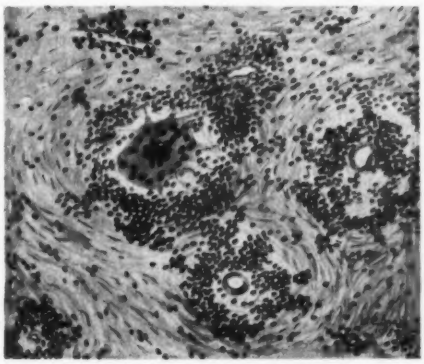

Fig. 6. Syphilitic induration of the vulva, showing hyperplasia of the connective tissue, many mononuclear lymphocytes, especially around the new formed capillaries, and a characteristic giant cell.

Case 3 had discontinued treatment also and showed no improvement other than the absence of the tumors. There were raw areas in the former sites and at the place of removal of the growth. Her Wassermann was again taken and showed a 3+.

Case 4 was given in addition to the mercury and iodides to the point of tolerance, one injection of 0.6 gm. diarsenal. After dismissal from the hospital she reported regularly for treatment. Although but one month had elapsed there was almost complete healing. The unhealed portion showed a distinctly healthy appearance. The region of the anus did not look so promising.

It is my belief that a radical removal of the growth with a complete and thorough cauterization of the ulcerated areas—cauterization a second time if need be—with intensive antisyphilitic medication will effect a cure in these cases.

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NEW-GROWTHS OF THE TESTIS

Their Symptomatology, Pathology, Diagnosis, and Treatment[1]

By C. R. O'CROWLEY, M.D., F.A.C.S., and HARRISON S. MARTLAND, M.D., Newark, New Jersey

IN looking through the literature upon testicular neoplasms, one is struck by the variety of diagnoses, especially from a pathological standpoint. The classification and description of tumors of the testicle in modern genito-urinary textbooks are so meagre and incomplete, to say nothing of being incorrect, that the writer thought it would be of interest to bring the subject in more or less detail before this society. The reason for such a diversity of opinions in regard to the type of tumor we are dealing with is due to the fact that the growth was not carefully sectioned or studied enough pathologically or it would have been seen, in the greater proportion of cases, that we were dealing with a teratoma. For practical purposes there exists only one tumor of the testicle, namely, a teratoma. The testicular teratoma may appear in two forms, either as a complex teratoma containing tissue representing derivatives of all three embryonic layers, or as an embryonal carcinoma, alveolar or diffuse, polyhedral or rounded cells, often with lymphoid stroma. The latter is the most common tumor of the testicle, and it may or may not be possible to find in such a tumor other evidence of teratomatous elements, but even if no other teratomatous elements are found, it seems reasonable to agree with Ewing in regarding this tumor as a one-sided development of a teratoma. In considering tumors of the testicle, nine times out of ten, we are dealing with a malignant tumor, which requires very early diagnosis and radical treatment in order to prevent metastasis and consequent death. Hence a study of new-growths of the testicle comprises the study chiefly of carcinoma of that organ.

During the past eight years we have collected at the pathological laboratory of the City Hospital, Newark, New Jersey, thirteen cases of new-growth of the testicle, a brief summary of which follows:

Case 1. Age 5 years. Duration 12 weeks.
Case 2. Age 34 years. Duration not traceable.
Case 3. Age 40 years. Duration not traceable.
Case 4. Age 52 years. Duration 2 years, 7 months.
Case 5. Age 43 years. Duration 28 months.
Case 6. Age 39 years. Duration 2 years, 3 months.
Case 7. Age 40 years. Duration 14 months.
Case 8. Age 33 years. Still living after five years.
Case 9. Age 38 years. Duration 6 months.
Case 10. Age 17 years. Duration 10 months.
Case 11. Age 30 years. Still living after one year.
Case 12. Age 45 years. Still living after one month.
Case 13. Age 32 years. Still living after 15 months.

A few points of interest might here be noted. Seven out of thirteen cases that we have been able to follow have already died, developing metastases. Of the fatal cases the youngest was 5½ years, the oldest 52. The longest duration of the disease was two years and seven months, the shortest ten weeks. Six out of the thirteen cases gave a definite history of trauma. Trauma may have been a predisposing or etiological factor in these six cases, and then again it may have been the first thing to draw the patient's attention to the tumor or its increasing size. The size is not dependent upon the length of time the tumor has existed. In one case (9) an undescended testis was the seat of the growth. In the majority of cases the growth was usually slow but progressive.

If we go back to the embryological development of the testicle, you will recall that it develops from the undifferentiated genital ridge or body which is in close proximity to the wolffian ridge or body, the latter a complex structure, which, when it reaches its usefulness, starts to retrogress. In no other part of the body is there such a complex embryological structure, therefore the adrenal, future kidney and testicle which develop in such close proximity to this region are

[1] Final report on paper read before the American Urological Association, Chicago, 1917.

Fig. 1.

Fig. 2.

Fig. 1. Teratoma testis; this growth would be called in older classifications an "enchrondroma" of the testicle, because it is composed largely of hyaline cartilage. There is no difficulty, however, in finding numerous teratomatous elements in the tumor.

This tumor represents that class of testicular tumors in which teratomatous elements are found with ease.

Fig. 2. Teratoma testis; showing two specimens of the *common* testicular tumor. Both tumors consist almost entirely of alveolar, embryonal carcinoma with lymphoid stroma. It is only with great difficulty that other types of tissue can be found. The tumor metastases are carcinoma. Even if teratomatous elements can not be found, as often occurs, Ewing believes that such a tumor is a one-sided development of a teratoma.

These tumors represent the larger class of testicular tumors where the growth is always an alveolar, embryonal carcinoma with lymphoid stroma and in which other teratomatous elements are found with difficulty or not at all.

subject to weird embryologic processes, which result in the various complex and mixed tumors encountered in the adrenals, kidneys, and testicle.

It is through the lymph channels that metastases occur, chiefly in the retroperitoneal and lumbo-aortic nodes. The growth metastasizes as carcinoma and not as teratoma. Recurrences have occurred as early as one month following operation. Howard found that among 110,000 male patients admitted to a number of the London hospitals during a period of twenty years, there were 65 cases of malignant testicular disease, or about .06 per cent of all male patients admitted. Of 57 cases with complete histories, 9 were in ectopic testicles, 8 of these being in the inguinal canal and one just below the external ring. In 12,729 consecutive male admissions to the Presbyterian Hospital in New York City there were found 13 malignant testicular tumors. Of these, 11 were situated in the scrotum and 2 within the abdomen. Thus in 182,729 male admissions to general hospitals there were 3 cases of malignant growths of intra-abdominal testicles, or about 1 in each 60,000 cases. With such statistics it seems no more than right that we should report all cases. Coley, during the past twenty-five years, has personally observed 65 cases of sarcoma of the testicle. In 52 the disease occurred in the entirely descended testicle, and in 12 in the undescended. Seventy-five per cent occurred between the ages of twenty-five and forty-five.

CASE 1. A. B. Age 5. Well nourished, always healthy. Parents noticed a swelling of right testis which increased rapidly, reaching the size of a small hen's egg in one month's time, with involvement of the inguinal nodes and overlying skin. The tumor was removed at operation with three enlarged lymph nodes and structures extending up to the internal ring. The wound healed promptly, but after two weeks there was increasing anæmia, loss of flesh, fever, and prostration. One month later, several firm nodules appeared in the skin of face and neck. With rapidly increasing anæmia, fever, and weakness, the child died two weeks later.

Gross examination. The tumor of the testis measures 3x2½x2½ centimeters. It involves the

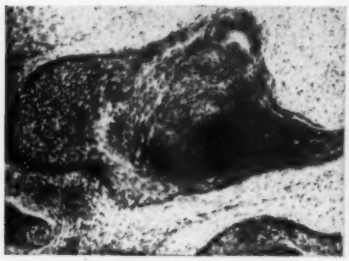

Fig. 3.

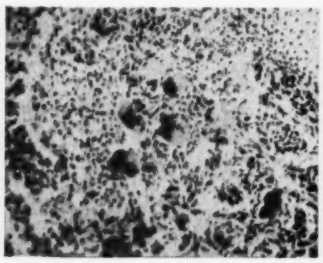

Fig. 4.

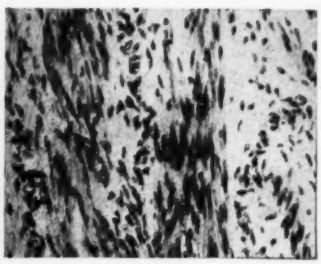

Fig. 5.

Fig. 3. Teratoma testis, showing epidermal tissue.
Fig. 4. Teratoma testis, showing giant-cells of the osteoclast type and small area of hyaline cartilage.

Fig. 5. Teratoma testis, showing smooth muscle. This tissue comes from the middle of a large growth of the testicle.

corpus highmore, rete, and epididymis and fuses their structure with the surrounding tissues. In the overlying skin there is no diffuse invasion. A circumscribed portion of intact testis which is found to be the whole organ lies at the posterior pole of the tumor sharply separated by a fibrous partition. The tumor is firm, well encapsulated, and free from necrosis.

Microscopic examination. The testicular tumor is composed of diffuse areas of small and medium sized lymphocytes. Many cells show distinct cell body. This neoplastic tissue widely separates the intact tubules of the rete and epididymis and invades the neighboring fat lobules. The larger lymph nodes are completely replaced by medium sized tumor cells. In the capsules of the main tumor, the lymph nodes, and in the adherent overlying skin there is a diffuse infiltration by small lymphocytes.

Diagnosis. Lymphosarcoma primary in the rete and epididymis. Metastases in skin, inguinal and abdominal lymph nodes, liver, and kidneys. Duration twelve weeks.

Autopsy examination. Showed extensive enlargement of the retroperitoneal lymph nodes, the largest 1¾ centimeters in diameter. In both kidneys there were areas of diffuse infiltration. The lungs and liver showed several miliary lymphomata. The spleen was moderately enlarged, section smooth, firm, grayish, follicles nearly invisible. Throughout the colon were numerous follicular ulcers. Peyer's patches were slightly swollen. Attached to the peritoneal surface of the colon were several small movable lymphomata.

The histological features of this tumor are in all respects typical of malignant lymphosarcoma. That the original tumor arose in the testis seems a necessary conclusion from the relative size of the tumors, that in the testis being much larger than any of the lymph nodes and showing local out-growths of considerable extent as well as extensions in the overlying skin. The testicular tissue was found free from invasion by lymphocytes, while the rete and epididymis were extensively involved, hence we must conclude that this tumor started in the rete and epididymis rather than the testicle proper (which is the

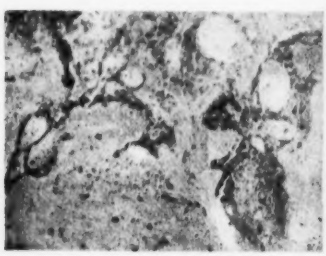

Fig. 6.

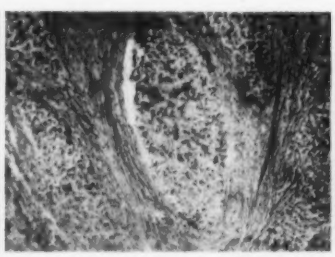

Fig. 7.

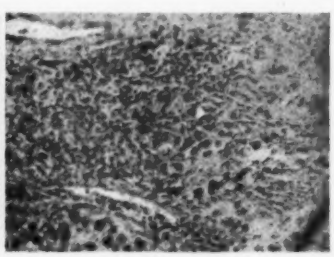

Fig. 8.

Fig. 6. Showing area of hæmangio endothelioma.
Fig. 7. Teratoma testis, showing alveolar, embryonal carcinoma with lymphoid stroma.

Fig. 8. Teratoma testis, showing alveolar, embryonal carcinoma with lymphoid stroma.

starting place of teratoma). No evidence was found of a trace of teratomatous elements.

(This case was studied by Dr. Ewing and described in his excellent paper, "Teratoma Testis and its Derivatives." *Surgery, Gynecology and Obstetrics*, March, 1911.)

CASE 2. M. G., age 34. No tuberculosis or cancer in family. Is moderately alcoholic, negative venereal. Eight years ago he was struck in left testicle by a piece of coal; he says that the testicle did not pain or swell after the injury. Five days before admission to hospital he had severe pain in left testicle, without any apparent cause. He felt along the testicle but noticed no swelling. The next morning he noticed a lump alongside of the left testicle about the size of a small peanut, very smooth, heavy and painful.

Physical examination. All viscera were in good condition. The lungs were negative. In the left half of the scrotum was felt a mass about 2 centimeters in diameter, hard, independent of the testicle but its movement limited.

Operation. An incision was made in the upper part of the scrotum 4 centimeters long, extending upward to the external ring. The epididymis was thickened, and it was drawn down and the vas ligated near the internal ring. In the globus major of the testis there was found a nodular mass, the size of a finger-nail, which encroached slightly upon the testicle. The testicle with its structures was removed. The wound healed promptly and the patient made a rapid recovery.

Gross examination. The testis measures 2.5x2.5x4 centimeters, its tunica albuginea is smooth and glistening, its parenchyma normal. Situated in the globus major of the epididymis and rete testis, but not involving the body of the epididymis, is an oval, firm mass about 1 centimeter in diameter. On section this mass is greyish white in color and there are no evidences of caseation. The rest of the epididymis is normal.

Microscopic examination. The tumor of the rete and epididymis is composed of diffuse areas of small lymphocytes. Many cells show distinct cell body. There are no areas of caseation, or other evidence of tuberculous granuloma. Occasionally there was found small acini lined with cuboidal and flattened epithelium. We do not believe these are the compressed tubules of the epididymis or vasa recti and if they are not remnants of certain embryologic tubules, they might play an important rôle in proving the teratomatous origin of lymphosarcoma.

Diagnosis. Very early lymphosarcoma of the rete and epididymis containing epithelial structures. Duration not traceable.

CASE 3. N. W., age 40. The patient has always been in perfect health. Two years ago he noticed small lump in right testicle, hard, which caused a small amount of pain on pressure. The mass gradually grew until it reached the present size. He had no pain or discomfort except increase in weight of testicle.

Operation. The testicle was removed, the epididymis appeared only slightly thickened in the globus major. The wound healed promptly and the patient quickly recovered.

Gross examination. The specimen consists of a solid tumor of the left testis measuring 6x6x9 centimeters, of firm consistency. On section the tumor cuts quite hard and is well confined to its tunica albuginea, which is thickened and laminated. The greater part of this tumor shows oval, round, and irregular branching masses of a pearly white color (cartilage). Numerous cavities from 1 to 4 millimeters in diameter filled with a colloid material of greyish to brown color are seen scattered over a large portion of the tumor. Two large cavities 1 centimeter in diameter contain yellowish colored colloid. The epididymis is not thickened.

Microscopic examination. The main part of the tumor is composed of irregular islands of hyaline cartilage. There are also present bundles of smooth muscle, considerable lymphoid stroma, areas of fibrosarcoma and a few scattered epithelial lined cavities with low cuboidal cells. Some of the larger cavities contain colloid material, resembling thyroid acini.

Diagnosis. Teratoma testis containing cartilage, smooth muscle and lymphoid tissue.

CASE 4. J. H., age 52. During the last two years the patient has noticed a slowly growing tumor of the right testis, which during the last two months has grown rapidly reaching its present size and causing considerable pain. For the last six months has lost weight and feels exceedingly weak.

Examination on admission to hospital. The patient is extremely emaciated, dyspnœic and weak. A large tumor is present in right half of scrotum, with nodular masses along cord and in inguinal canal. Considered inoperable.

Result. Died one month after admission, and autopsy showed extensive masses in retroperitoneal glands, and metastatic nodules in lungs and liver.

Gross examination. The specimen consists of a solid tumor of the right testis, measuring 7x7x8 centimeters. On section, the lower half shows oval, round, and irregular masses of cancer, yellowish in color and surrounded by fibrous trabeculæ; the upper half shows extensive necrosis with hemorrhagic extravasation. Normal testicular tissue cannot be found. The epididymis and cord are extensively involved with solid carcinoma.

Microscopic examination. The large part of the tumor is composed of large celled alveolar carcinoma with extensive areas of necrosis. There are also small areas of cartilage, fat and smooth muscle tissue. In places there is extensive lymphoid infiltration of the stroma.

Diagnosis. Teratoma testis, showing large alveolar carcinoma (sarcoma), fat and smooth muscle

Fig. 9. Case 6.

tissue, minute islands of cartilage, with extensive necrosis.

CASE 5. T. C., age 43. No cancer or tuberculosis in family. The patient has always been well, but nervous. Eight years ago he had vague stomach trouble. He denies venereal diseases and excesses.

Present history. One year ago, while stirring varnish with a big stick, he noticed a sharp pain in left inguinal region, shortly after which the left testicle began to swell. The swelling gradually became larger and firmer in consistency.

Operation. Orchidectomy, tumor of the size of an orange removed with small amount of epididymis and vas. Recovery was uneventful, with primary union in wound.

Result. Three months later, after sea bathing and considerable swimming, the patient complained of a severe chill; the next day noticed a hæmatoma in site of scar. The old scar soon broke down, with considerable oozing, and a second operation was done, removing an elliptical mass including the scar tissue and cord and vessels up to the internal ring. At the present time the wound has healed again, but in the inguinal canal near the internal ring is a nodular mass. Otherwise his health is fair. We expect this case to develop metastatic growths. Within three months he had another recurrence in same site which rapidly became tremendous in size. The patient became rapidly emaciated and cachectic and developed metastatic growths.

Gross examination. The specimen consists of a solid tumor of the left testis, measuring 5x7x7 centimeters. The tumor is well confined in its tunica albuginea, but invaded the mediastinum, rete testis, and globus major of the epididymis. The cord above is not thickened. On section the tumor presents a variety of areas, some yellowish in color (carcinoma), others shades of red (hæmorrhage). A very few minute areas of pearly white color (cartilage) can be seen near the center. Scattered over various portions can be seen small cysts 2 to 4 millimeters in diameter containing colloid. No trace of testicular tubules can be seen. The whole tumor is quite œdematous.

Microscopic examination. The tumor is composed largely of very œdematous embryonal connective tissue, which in places is so cellular and packed that it may be called fibrosarcoma and small spindle sarcoma. Scattered in the stroma are numerous collapsed and distended cavities lined with low cuboidal epithelium; some of these contain a colloid material and appear to be thyroid tissue. Numerous areas are present, composed of alveoli of large polyhedral cells with large vesicular nuclei and scant cytoplasm; the stroma around these areas is frequently infiltrated with lymphocytes.

Diagnosis. Complex teratoma with cartilage, thyroid tissue, epidermoid cysts, smooth muscle, lymphoid tissue, glandular structures, lined with cuboidal and cylindrical cells, alveolar and diffuse carcinoma. Duration 18 months.

CASE 6. T. K., male, age 30. The past history is uneventful. Two years ago the patient was hit in the scrotum on right side; soon after a mass developed which gradually increased in size. Two weeks before admission to the hospital he had sharp pain in the right lower quadrant of the abdomen. He has had pain more or less ever since, often shooting down the right leg. The pain eases when lying down.

Physical examination shows a poorly nourished, anæmic man, with a few fine and coarse râles over the lower lobes of both lungs. In the right half of the scrotum is a large firm mass 15 centimeters in diameter, with distended veins running over the tumor. The urine and blood are negative.

Operation. The tumor with the adjacent structures was removed.

Result. The patient became rapidly emaciated after the operation, and developed on the seventh rib in the left axillary line a slightly movable hard mass 3x5 centimeters, apparently connected with the rib. He died three months after the operation with physical signs of bronchopneumonia and cachexia and extreme weakness.

Gross examination. The specimen consists of a large solid tumor of the right testis, measuring 9x12x14 centimeters, in some portions quite solid, in others there is a sense of fluctuation. The tumor is well confined by its tunica albuginea, is heavy and solid. The cord is only slightly thickened. On section the tumor has a yellowish color, and shows considerable areas of necrosis and hæmorrhage. In places bright yellow (fat) masses from 1 to 4 millimeters can be seen; also cartilage areas about the same size. The large portion of the tumor is distinctly carcinomatous.

Microscopic examination is of interest because the tumor is largely composed of carcinoma, which has an arrangement in mantels around a central capillary, a "perithelial carcinoma." In many respects this tumor appears like portions of hypernephroma. Teratomatous elements are difficult to find, but are present in the form of cuboidal lined epithelial structures, small islands of cartilage, fat tissue, and smooth muscle.

Diagnosis. Teratoma testis, consisting chiefly of perithelial and alveolar carcinoma with lymphoid

stroma. Cuboidal epithelial structures, small islands of cartilage and adipose tissue, smooth muscle. Duration, two years, three months.

CASE 7. F. A., age 40. Past history and family history are negative. The patient noticed a tumor in the right half of the scrotum eight months ago. He has lost considerable flesh and strength and complains of dull aching pain in the right iliac region. He gives no history of trauma. He was under doctor's care four months before he came to hospital.

The physical examination is negative.

Operation. The usual incision was made, and the tunica vaginalis was found markedly thickened, and there were several small nodules felt along the cord. The cord was freed well above the internal ring, pushing the peritoneum away, it appeared normal and was ligated. No inguinal or femoral glands were palpable. Primary union in wound, but the patient had an afternoon temperature reaching 102° F., off and on for several days. He received 21 injections of Coley's fluid.

Result. Three months after operation the patient complained of indefinite pains in the abdomen, under the ribs and over the back of the chest. On examination he was quite dyspnœic; no local recurrence of palpable masses was found. Two months later, a mass the size of a duck's egg developed on the left side of the neck just above the clavicle. There was found an indefinite sensation of a mass near the umbilicus, with small areas of dullness plus fine râles scattered over both lungs. He was cachectic, markedly emaciated, and extremely weak. He died one month later.

Gross examination. The specimen consists of a solid tumor of the right testis measuring 4x6 centimeters, oval, quite firm in consistency, and on section yellowish in color. It is quite well confined to the testis except at its inferior pole where it infiltrated the tunica albuginea and tunica vaginalis. There is a small clot of blood in the cavity formed by the tunica vaginalis. The latter is quite thick over the adherent area. On section the tumor is composed of round and oval masses of cancer, 1 millimeter to 2 millimeters in diameter, there is extensive infiltration of the mediastinum, body, and globus major of the epididymis. The vas shows carcinoma for at least 6 centimeters above the testis.

Microscopic examination. Sections made from the center and edges of the growth show it to be composed largely of large alveolar celled carcinoma containing large vesicular nuclei, well defined nucleolus, and scanty cytoplasm. In many places a typical picture of adenocarcinoma is seen; in other areas diffuse carcinoma with lymphoid stroma. In addition there are frequent bundles of smooth muscle and small lymph nodes with germinal centers and large areas of necrosis.

Diagnosis. Teratoma testis, adenocarcinoma, alveolar and diffuse carcinoma, lymph nodes, epithelial structures, and thyroid. Duration 14 months.

CASE 8. A. G., age 33. Family history and past history are negative. Without any apparent cause two and one-half months ago an enlargement started in the right side of the scrotum without pain or other symptoms. The patient gives no definite history of trauma.

Operation. The radical operation was done. A celluloid testicle was inserted for cosmetic effect. Recovery uneventful.

Gross examination. Solid tumor of the right testis measuring 4x6x6 centimeters. The tumor is well confined in the tunica of the testis; the tunica vaginalis and epididymis are not involved. On section, hard, yellowish and grey in color, rather broad connective trabeculæ traverse tumor. A very small amount of compressed testicular tissue is seen at the lower pole lying just beneath the tunica albuginea.

Microscopic examination shows the tumor to be composed of large-celled alveolar carcinoma with lymphoid stroma and areas of necrosis. No other types of tissues were found.

Diagnosis. Carcinoma with lymphoid stroma.

CASE 9. T. W. L., age 38. Family history, past history, and personal history, negative. The patient has always been well but states that he never had but one testicle in his scrotum and that he was conscious of the presence of the other one low down in his groin. Three months ago while attempting to move a large piano he felt a snap in his left groin and when he felt of himself there he noticed he had two testicles in his scrotum, but the one on the left side was high up and much smaller. He complained of very little pain at the time but in a few weeks this left testicle started to enlarge and was quite painful, due mostly to the pulling on the cord.

Physical examination. A powerfully built, tall, and healthy looking individual. Tight up against the external ring on the left side was a firm mass the size of a small orange.

Operation. Orchidectomy.

Result. The wound healed promptly and the patient went home from the hospital in about two weeks. Within a month he started to fail, rapidly losing flesh and strength, and showed clinical evidences of metastases. He died six weeks later.

Gross examination. Solid tumor of left testicle measuring 9x9x4 centimeters, confined within tunica. No remains of testicular tissue are seen. On section, encephaloid, red and yellow areas are intermingled.

Microscopic examination. Carcinoma, alveolar, embryonal with areas of lymphoid stroma, extensive necrosis and hæmorrhage. Areas of cystadenoma. Epithelial glandular structures and smooth muscle.

Diagnosis. Teratoma testis (in an undescended testis). Carcinoma with lymphoid stroma. Cystadenoma. Epithelial structures, glandular. Smooth muscle. Duration, 6 months.

CASE 10. H. D., age 17. Family history, previous history, and personal history, negative. For the past five months the patient has noticed a

swelling in the right half of his scrotum which has slowly increased in size. There is no history of trauma. He complains of slight dragging pain, probably due to the weight of the tumor.

Physical examination reveals a well-nourished young man, with all viscera negative except the right testis, which is enlarged to about the size of a small orange. No translucency to light. Has firm feel.

Operation. Radical operation done.

Gross examination. Solid tumor of right testicle, measuring 11x6x5 centimeters. On section, the growth is soft and in places mottled reddish to greyish color.

Microscopic examination. Carcinoma with lymphoid stroma. Considerable myomatous tissue. Fibrosarcomatous areas. Small scattered amount of smooth muscle.

Diagnosis. Teratoma testis. Carcinoma with lymphoid stroma. Myoma. Fibrosarcoma. Smooth muscle.

Result. Four and a half months later the patient showed clinical evidences of metastases in the liver and lungs and died shortly after. Duration 10 months.

CASE 11. P. U., age 30. Family history, past history and personal history, negative. Two months ago while doing some gymnastic work he fell astride of a horizontal bar and that same evening he had some little pain in his right testicle. In a few days he was apparently well but about a month later his right testicle started gradually to increase in size, but with no pain.

Physical examination was negative except for a tumor mass in the right half of his scrotum.

Operation. The radical operation was done.

Gross examination. Solid tumor of the right testicle measuring 9x5x4 centimeters. Quite firm. On section, yellowish to greyish white.

Microscopic examination. Carcinoma, alveolar, embryonal with lymphoid stroma. Considerable fibroplastic tissue.

Diagnosis. Teratoma testis. Embryonal carcinoma with lymphoid stroma. Duration: patient at present writing (August 24, 1918) is alive and apparently well.

CASE 12. F. B., Male, age 45. Past history, personal history and family history negative. No history of trauma. The patient noticed a small lump in the right testicle two months ago, which has steadily grown in size until the present time.

Physical examination was negative except for a tumor mass in the right half of scrotum. No glandular involvement palpable.

Operation. Orchidectomy with removal of adjacent structures.

Gross examination. Solid tumor of the right testis 3x4x2 centimeters, tumor confined within tunica of testicle, tunica vaginalis and epididymis not involved. On section, greyish white and reddish in color. Distinctly cystic, about the consistency of a rubber sponge.

Microscopic examination. Tumor composed chiefly of adenomatous areas with cystadenoma, histologically benign. Small areas of hyaline cartilage and smooth muscle.

Diagnosis. Adenoma simplex, cystadenoma, cartilage, and smooth muscle. Teratoma. Duration: at present writing (August 24, 1918) patient is alive and apparently well.

CASE 12. G. K., male, age 32. Past history, family history, and personal history, negative. The patient thinks he was struck by a baseball in the scrotum a few years ago. He now has a swelling in the left side of the scrotum which has been gradually increasing in size for three or four months. The tumor gave no pain or light translucency.

Operation. Orchidectomy with adjacent structures.

Result. Patient made an uneventful recovery but four months later he presented himself with a growth in the site of the operative scar two-thirds as large as the original tumor. He refused further operation.

Gross examination. Solid tumor of the left testicle measuring 5x6x3.5 centimeters. On section, greyish red in color with small cystic areas.

Microscopic examination. Adenocarcinoma chiefly and small areas of carcinoma with and without lymphoid stroma, few epithelial structures.

Diagnosis. Teratoma testis, adenocarcinoma, alveolar carcinoma, lymphoid stroma, epithelial structures.

DIAGNOSIS

As a rule the patient seeks advice on account of a swelling in either side of the scrotum, which he has probably noticed for months, and the increase in size has been very gradual. Pain is usually absent, unless the tumor is large enough to give a dragging sensation from its weight. The tumor may range in size from that of a horsechestnut to that of a cocoanut, being ovoid in shape. There may be soft, semi-fluctuating areas, due either to degeneration of tissue in one part or another, or to rupture of blood-vessels within the growth producing a hæmatoma, or to both. The surface outline as a rule is well defined, smooth, and slightly lobulated. In large tumors, the epididymis is flattened out by pressure and finally becomes invaded by the growth. The tumor may feel hard or semi-solid, except when it has an associated hydrocele. The very large growths have a tense, elastic, cystic feel. The surface blood-vessels are greatly dilated and tortuous. The growth itself is non-translucent and

freely movable. Further examination very seldom reveals much of diagnostic value, the blood, urine, etc., has usually been negative.

Differential diagnosis. New-growths of the testicle are to be differentiated from tuberculosis and gumma. In tuberculous lesions, the family or personal history is of help, the growth is insidious in onset, increases in size more rapidly, is associated with pain, sometimes fever. The growth first manifests itself as a nodular mass in the tail of the epididymis. Often a chain of small nodules can be felt along the vas deferens. It is only later on in the disease that the testis in involved. Tubercle bacilli may be found in the urine, also indurations about the prostate and vesicle. Testicular tuberculosis is usually only one feature of a general genital tuberculosis. Testicular tuberculosis has recrudescences and exacerbations, suppuration, softening, breaking down, and fistula formation.

In gumma is a history of syphilis either hereditary or acquired, the testicle is evenly enlarged with a "clam shell" epididymis and nearly always has an associated hydrocele. Positive Wassermann is of help.

PROGNOSIS

The mortality is very high and Chevassu reports that of 100 cases treated by castration, 81 died, 19 recovered.

Died within 1 year	38
Died within 2 years	17
Died within 3 years	9
Died within 4 years	2
Date uncertain	15
	81

Of the writer's thirteen cases seven died as follows:

Within 1 year	3
Within 2 years	2
Within 3 years	2
	7

TREATMENT

The majority of surgeons who have operated upon these growths have done little more than castration and excision of the cord. Such a minor procedure may be sufficient in those cases where a very early diagnosis is made; in other words, before there is an invasion of the regional glands.

The only hope surgeons can have of decreasing so appalling a mortality as we have in this disease is not only early recognition of the trouble, but its removal by the radical operation. Gregoire in 1905 performed the first complete radital operation and since then there have been but few cases reported. The mere fact that we get such a high mortality from recurrence in cases of orchidectomy, where we felt the regional glands clinically gave no evidence of involvement, while in truth the microscopical examination would invariably reveal an invasion by the growth, is sufficient to justify the radical operation in every case.

Coley believes that his own series of cases show that cancer of the testis treated by simple orchidectomy, without any appreciable risk, and followed by a thorough course of treatment with the mixed toxins of erysipelas and bacillus prodigiosus (also without risk) has a far better prognosis than that subjected to the very extensive laparotomy with removal of the lumbar glands, as advocated by Chevassu, Hinman, and others.

OPERATION

The incision which has been most often employed to allow of removal of the testicle and cord and to give access to the lumbar glands commences over the upper part of the scrotum, extends up to the external ring, along the inguinal canal, and is prolonged to a point half an inch above the anterior superior spine; the incision then curves upward until it reaches the costal margin at the level of the tenth rib. At the beginning only the first part of the incision to the external ring is made and the testicle and cord are dissected free. If there is any doubt as to the diagnosis, the testicle should be incised at this point. If malignant disease is present the operation is continued. The incision is prolonged in the direction defined above and carried through the muscle of the abdominal wall until the peritoneum is reached. The cord is traced until it passes

through the internal abdominal ring, and then while the sides of the incision are strongly retracted, slight tension is applied to the cord so that its further course may be easily recognized. In its retroperitoneal course the vas is adherent to the posterior aspect of the peritoneum, and the next stage in operation consists in freeing the cord and reflecting the peritoneum mesially. The cord is traced down well into the true pelvis and there divided between two ligatures, the cut surface being treated with the cautery or pure carbolic. This may be regarded as the first stage in the operation and requires no extraordinary care. The second stage consists in the free dissection of the fascia over part of the iliacus and psoas muscle, together with the contained spermatic vessels and lymphatics, and the removal of the glands from off the inferior vena cava and aorta. When the vas has been divided the spermatic vessels are seen no longer to form a rounded bundle but to become spread out. It is therefore necessary to make a wide dissection of the fascia on the outer side and this should extend to the outer border of the psoas. On the inner side the line of division of the fascia should pass mesially so as to cross the common iliac at its bifurcation; the ureter will here be encountered and must be freely exposed. The dissection is then carried along the inner side of the common iliac vessels up to the bifurcation of the aorta. When the left testicle is affected the inner boundary is carried up along the right border of aorta, and special care must be taken not to injure the inferior mesenteric artery. When the right testicle is the seat of the tumor, the inner border is continued over the middle of the aorta. In both cases the upper limit is the upper border of the renal veins. Between these boundaries everything must be removed. During the dissection the spermatic vessels are traced up to their junction with the main vessels and must be ligated and divided. When all bleeding points have been secured the peritoneum is allowed to return into position and the abdominal wound is closed without drainage, each of the muscles being stitched up separately.

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THE RADICAL OPERATION FOR TERATOMA TESTIS

With the Report of Five Cases

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TERATOMA testis treated by simple castration is a highly fatal disease with a final mortality of over 85 per cent (1). The desirability of any method of attack that will give better results is obvious. The surgical problem was reviewed by the author in 1914 and summarized as follows:

"Cancer of the testicle metastasizes in practically every case first and primarily to a limited zone of lumbar lymph-nodes which lie on the aorta for the left testicle and on the vena cava for the right, between the bifurcation of these vessels and the renal pedicle (Fig. 1). Communication between these two groups and to deeper or more distant glands occurs only secondarily.

"Involvement of these primary lymph-nodes may occur early or late, and the preoperative duration of the tumor in the testicle, its rapidity of growth or its size give no definite clinical indication of the onset or extent of such metastasis, but the probabilities increase the longer the duration and the more rapid the growth.

"The primary lymph-nodes are a very imperfect guard against secondary invasion, and metastasis to other gland areas by way of efferent lymph channels, or by blood-vessels to thoracic or abdominal organs, may occur early. Surgical treatment is of no avail after these secondary metastases have occurred. The only hope, therefore, in a radical operation is the removal of the testicle with its primary lymph area before the disease has spread beyond this zone.

"The experience of various surgeons in a total of 46 cases has demonstrated in suitable cases the feasibility and technical ease of the radical operation with a combined surgical mortality in all cases of only 11 per cent (3 deaths from pneumonia, 2 from peritonitis).

"Radical operation should never be undertaken when lumbar metastases are recognizable clinically, and is applicable only in the fairly early cases in which the disease is apparently limited. Owing to the deep position of the glands, these cases cannot always be differentiated before operation, so that every case, in which clinically there is no invasion, is suitable for radical treatment. The operation should never be performed until after the diagnosis is confirmed (by gross inspection after castration).

"Sufficient time has not elapsed and the cases are so scattered that it has not been possible to get the ultimate result in all of the patients treated radically. Forty-six per cent are alive; one for five years; one for four years, five for almost three years, two for over two years and eleven for one year or less. There is a probable cure in at least four cases which had lumbar glands invaded with cancer at the time of the operation. Simple castration could not have benefited any of these cases, and their cure is directly attributable to the early and clean removal of the affected lymph area.

"In conclusion, therefore, it may be stated that the early removal of the testicle with its primary lymph zone is the rational method of surgical treatment of teratoma testis; but the extensive nature of the operation and the fact that almost one-third of the cases thus treated were found to be inoperable warrants a very careful selection of suitable cases."

Since its publication this conclusion has been both supported and questioned. A recent criticism appears in Cabot's *Modern Urology*,[1] in a monograph on tumors of the testicle by Edwin Beer: "Even though at present the mortality of this operation is much higher than that of simple castration, experience has shown that such is the case with all new operations. The writer feels confident that during the next decade the mortality from this extensive operation will be markedly reduced. Moreover he believes that we are justified in expecting better end-results when the gland-bearing area is removed. Operations for malignant disease in

[1] Vol. i, p. 540.

other parts surely support this position. The fight against cancer cannot be half-hearted. The surgeon must strike hard or fail in his duty." A pronounced adverse opinion appeared in *Annals of Surgery*, 1915, vol. lxiv. An examination of Coley's claims,[1] that a far better prognosis is secured by orchidectomy when followed by the use of mixed toxins than by radical operation proves disappointing.

The first successful resection of the lumbar gland-bearing area was performed August 26, 1906, by Cuneo of France, who removed four enlarged lymph-nodes one of which showed teratomatous invasion and the man remained well and free of metastasis for 3 years when he was lost from observation. Raymond Gregoire introduced the operation April 20, 1905, in an inoperable case and has since done 5 operations 2 of which have been successful. Maurice Chevassu strongly champions the principles involved and has himself reported 3 cases. The seemingly extensive and dangerous nature of the operation has discouraged its general use. It is significant that from America with its high surgical standards and recognized surgical ability not a single report can be found in the literature of the successful performance of this operation.

It is the purpose of this paper to emphasize the relative simplicity and the real necessity of radical measures, and, by way of demonstration, to report five successful cases; four of whom would certainly have died from metastases if simple castration alone had been performed and in all of whom the operative difficulties were not great and the post-operative complications insignificant.

TECHNIQUE OF RADICAL OPERATION

The operation is done in two parts. In the first a simple castration is performed through a high inguinal incision. The cord is dissected high and divided upon a clamp with an actual cautery. This clamp is left in place for traction on the spermatic vessels in the subsequent procedure. If the gross pathological inspection of the tumor on section confirms a diagnosis of teratoma the second step of the operation is immediately undertaken.

Position of the patient. The position of the patient is of considerable importance in enabling one to get a satisfactory exposure of the pre-aortic area. A medium sized pad is placed under the opposite costal margin. The opposite leg is slightly flexed and the corresponding one kept straight so as to fit the hips in an oblique position. The patient should not be completely on his side but in a position halfway between the lateral and dorsal one. The usual kidney position is too extreme for satisfactory exposure. The arms should be folded in front of the patient and the sleeves pinned together to hold them in this position and the shoulders should be more nearly up and down than the hips. The position is a bent dorso-lateral one.

Line of incision. The incision is so extensive that certain nerve trunks supplying the abdominal muscles and skin areas over the hip, upper thigh and pubic regions are almost always divided. Nevertheless by curving the incision so as to follow the course of the iliohypogastric and ilio-inguinal nerves the larger and more important branches remain uninjured. The incision is extended from the high inguinal one, previously made over the external ring, to a point about 2 centimeters inside of the anterior superior spine following the general direction of Poupart's ligament and then is carried in a curved direction to about 1 centimeter below the tip of the twelfth rib which it parallels for about half its length (Fig. 2). The fascia of the external oblique is divided from the external ring in the course of its fibers (Fig. 3) and from this point the muscle bundles may be split by blunt dissection as they follow closely the direction of the skin incision. The internal oblique, transversalis, and latissimus dorsi muscles are divided with a scalpel in the line of the incision In making this long cut in the muscles the hypogastric branch of the iliohypogastric nerve should not be divided. The iliac branch, however, must be sacrificed. (In

[1] He reports 52 cases of scrotal tumors thus treated only 2 of which (both dead, Cases 9 and 41) showed involvement of the lumbar glands clinically at the time of castration. Of the remaining 50, 18 are dead, 14 have been lost from observation and 18 are living. Of these 18 who are still living 9 have well marked metastases clinically and cannot reasonably be expected to survive. Of the other 9 who show no metastasis clinically Cases 1, 2, and 15 are alive over four years since orchidectomy; Cases 37, 47, and 5, over 3 years; Case 16, over two years and Cases 21 and 25 over 1 year. Excluding the two inoperable cases and the 14 for which results are not stated the remaining 36 show a certain mortality of over 80 per cent while not one of the remaining 20 per cent has lived long enough to be pronounced cured.

none of the four cases has there been any postoperative trouble with constipation from muscle paralysis).

Stripping of the peritoneum. The only difficulty in stripping up the peritoneum is encountered in the lower portion over the iliac vessels, and in the neighborhood of the bladder (Fig. 4). As a rule the spermatic vessels, as well as the ureter, tend to strip up with the peritoneum in this portion. When this occurs it increases the difficulty of a clean dissection considerably. It can usually be prevented by putting gentle traction upon the cord at the time the peritoneum is stripped from along Poupart's ligament so as to keep the cord and its vessels recognizable. The peritoneum by gentle gauze dissection can then be stripped back without carrying the spermatic vessels with it. At the point where the vas deferens passes down behind the bladder the peritoneal boundaries may be with difficulty outlined. This dissection should be carefully completed before proceeding with that above. After the vas deferens has been divided at the point where it disappears behind the bladder, with gentle traction on the clamp holding the cord, the peritoneum usually strips back easily so as to expose the iliac vessels and the aortic bifurcation. The further retroperitoneal exposure of the abdominal aorta is usually not difficult. The gloved hand can be pushed between the parietes and the peritoneal surface, exposing in succession, the psoas muscles with the ureter overlying them, the lower pole of the kidney, and, finally, the aorta and the vena cava (Fig. 5). The peritoneal dissection should be carried high to the renal pedicle. In three cases the largest lymph-gland was found at this level and the subsequent dissection of lymphatic areas is much facilitated by a complete and thorough retroperitoneal exposure. The peritoneum with the abdominal contents behind can be held back with moist gauze sponges beneath broad retractors. In none of the cases was the peritoneum opened, except in Case 4, when in attempting to dissect out the vas deferens in the inguinal region, a small tear was made which was probably due to the fact that stripping of the peritoneum had been attempted high up before this lower exposure had been completed.

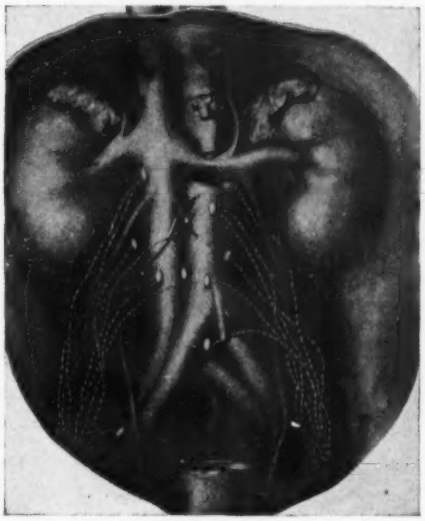

Fig. 1. Diagramatic representation of the primary lymph nodes of the testicles. (In Cases 2, 3, and 4, a gland the size of an almond with tumor metastasis was removed from position X.)

Resection of lymphatic areas. This is likewise more thoroughly done in two steps; first, dissection of lymphatic tissues from off the iliac vessels and aortic bifurcation and second, dissection of pre-aortic lymph areas and spermatic vessels. In every case, as shown in the illustrations, there were masses of lymph tissues lying on the external and common iliacs as far up as the aortic bifurcation. This area had to be cleaned separately from the spermatic vessels. It was easily effected in the four cases by careful blunt dissection with the dissecting scissors, beginning low on the external iliac and working along this vessel to the bifurcation of the aorta. At this point lymph tissues may extend deep down on to the sacrum and care in removing them is necessary in order to avoid injury to the middle sacral artery.

The pre aortic area may be resected in one of two ways: from above downward, or blow upward. With good retraction and complete peritoneal stripping of the area a beautiful exposure is possible. Traction upon the

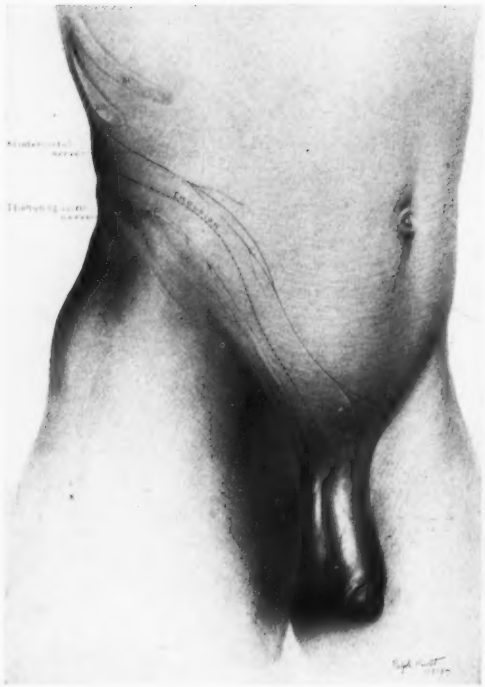

Fig. 2. Diagrammatic representation of line of incision (right side) curved to follow general course of long nerves so as to prevent temporary muscle paralysis and the resultant troublesome bowel stasis.

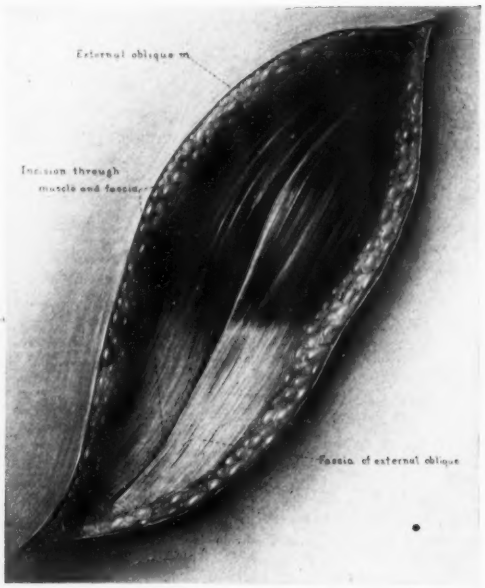

Fig. 3. Diagramatic drawing of external oblique with fibers and muscle bundles split in line of incision. (Left side.)

clamp about the spermatic vessels is of considerable help in effecting a clean removal. The ureter should be carefully dissected free of the fascial coverings and held aside by a narrow tape as shown in (Fig. 5). In most of the cases it was found advantageous to conduct the dissection from below, upward to within a short distance of the renal pedicle, and then complete the removal of the lymph area by freeing at it its upper portion, and dissecting down to meet the former dissection. In two of the cases (2 and 4) the glands and lymph tissues were quite adherent to the vena cava in this area. Frequently there was considerable venous oozing directly from the vena cava when small veins were torn or cut at its surface, but in no instance was there difficulty in thoroughly ligating these points. In some instances a portion of the wall of the vena cava was seized in the clamp and caught afterwards in the ligature. This was particularly noticeable in Case 4 in which the adhesions were most marked. In this case metastasis to the lymph-nodes was extensive, and apparently there were numerous small venules directly from the vena cava supplying them. In all instances, by careful dissection, it was possible to remove the spermatic and lymph areas *in toto*. The spermatic artery can be easily clamped as it issues from the aorta, and the spermatic vein as it enters the vena cava or renal vein, the points being easily found when gentle traction is placed on the vessels.

Drainage. It is, of course, necessary that drainage be placed after the resection of such an extensive lymph area, and this is usually satisfactorily effected by placing a long rubber tube over the aorta down to its bifurcation and curving back above the ilium with exit at the upper back portion of the wound as for kidney drainage. (It would seem feasible in those cases with extensive gland areas and apparent metastases, to place a small rubber tube or catheter in the end of which is fastened

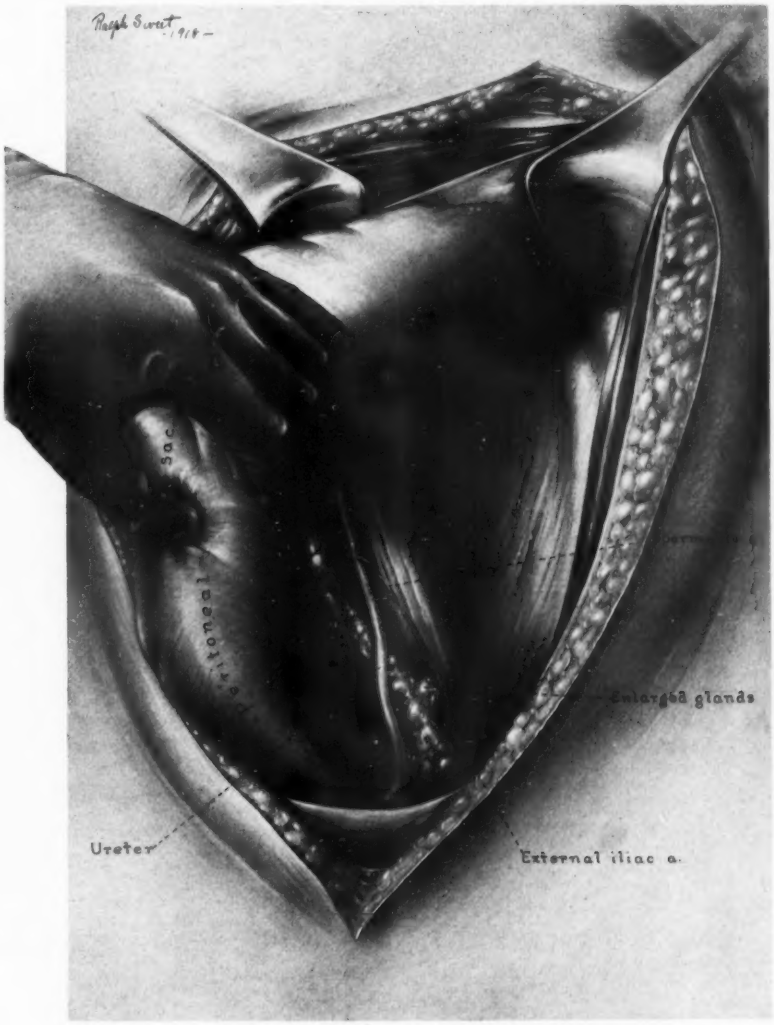

Fig. 4. Drawing, made at time of operation (Case 2 left side), showing lymphatics and fascias along iliacs. Stripping of peritoneum is most difficult at the lower portion where the vas deferens descends behind the bladder. The spermatic vessels tend to strip up with the peritoneum. This is prevented by gentle traction on the proximal end of the cord.

a 50 milligram tube of radium alongside of the rubber drainage tube. In this way the metastatic lymph area could be radiated from above downward by removing the catheter certain distances at intervals of one or two hours.)

Closure. Closure should be in muscle layers and thorough. The lower part is best closed as for hernia. In closing the muscles especial care should be used to avoid including in the ligatures any of the long nerves of the abdomen.

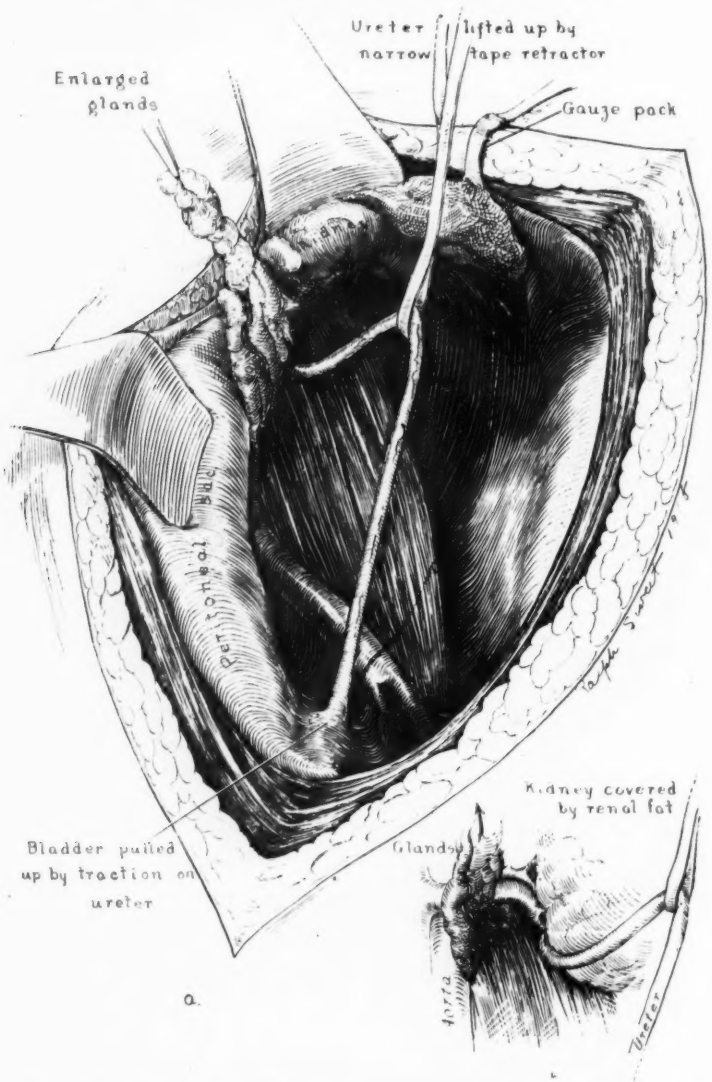

Fig. 5. Drawing showing the dissection of the pre-aortic gland area. (Case 2, left side.) The ureter is held aside by a tape. Insert shows dissection near renal pedicle. (Gland mass should lie upon vena cava between it and aorta and not as drawn.)

REPORT OF CASES

CASE 1. E.L., age 33. (S) Danish. In July, 1915, the patient first noticed that his right testicle was larger and harder than the left. In the spring of 1917 for about one week while the patient was working unusually hard it was quite painful. There is no history of trauma.

The patient's general health has always been good. Neisserian infections at 17 and 19. With the first there was swelling of the left testicle and of the prepuce. After the swelling of the prepuce had subsided the patient noticed a scar on the glans but at this time all blood tests were negative for lues. He has never had antiluetic treatment. Following

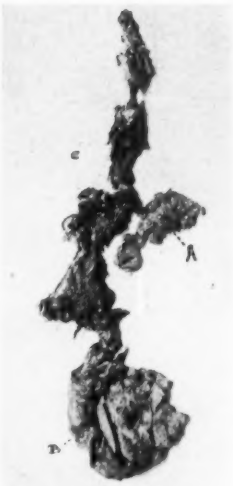

Fig. 6. Case 1. *a*, Lymphatic tissue, fat and fascia from the region of the iliacs and aortic bifurcation; *b*, tumor of testicle (much mutilated by pathologist) with lower portion of cord; *c*, spermatic vessels, fascia and glands from the region of the vena cava and aorta.

Fig. 7. Photograph of Case 1 (right side) few days before leaving hospital shows dimpling at upper part of wound where drainage tubes had exit.

Fig. 8. Photograph of specimen removed from Case 2. *a*, Large lymph gland which lay between the aorta and vena cava just below the renal pedicle; *b*, tissues from iliacs and aortic bifurcation; *c*, tumor of testicle and lower portion of cord.

the epididymitis the patient had bilateral bubces which were incised. No complication with the second attack of gonorrhœa.

Physical examination showed a rather well developed and well nourished ambulatory male. The skin was negative except for operative scars in the inguinal regions. Sclera and mucosa, negative. Lymph-nodes negative, except inguinals excised. The head was peculiarly molded. The pupils were circular and equal; react to L. and A. There was an obstruction on the right side of the nose. He had pyorrhœa; much dental work had been done. The tongue protrudes slightly to the left; thyroid negative. Chest: deep anteroposterior diameter with fairly well marked dorsal kyphosis. Lungs: resonant and breath sounds fair. Heart: pulse normal; sounds regular and of good quality; no murmurs. Abdomen; muscular, held tensely. Liver and spleen not felt. *No masses felt.* Reflexes lively. Spine: kyphosis somewhat marked in dorsal region, but mobile.

Genitals: penis circumcised, shows scar on glans from old lesion. Left testicle is of normal size. Left epididymis probably slightly enlarged at lower pole. Right testicle is a tense fairly formed non-painful oval mass 4½ by 6 centimeters with epididymis loosely attached to back of it. No fluctuation. Light not transmitted. No nodulation. There is a cord-like mass at the upper anterior pole which is painful when rolled under the finger. Vas deferens not enlarged. Skin of scrotum is freely movable over the tumor mass throughout.

Owing to the past history a tentative diagnosis of gumma was made. Three successive blood tests were all negative and two salvarsan administrations caused no noticeable change in the tumor two weeks later. The patient was advised of the probability of tumor.

Fig. 9. Photograph of patient, Case 2, taken by Dr. Craig, in Lakeport, after returning home, four months after operation.

Fig. 10. Photograph of specimen, hardened in formalin, of Case 3, removed in three pieces. *a*, Testicular tumor and lower portion of cord; *b*, loose fibrous lymphatic and areolar tissue from the region of the iliacs and aortic bifurcation; *c*, spermatic vessels and lymphatics from the pre-aortic area. The large lymph gland *d*, with well marked metastasis (seen cut in half and block removed for microscopical sections from upper half) at the upper part of photograph, lay upon and between the aorta and vena cava about 3 centimeters below the renal pedicle.

Operation. December 13, 1917. The high operation for castration was performed. The testicle was

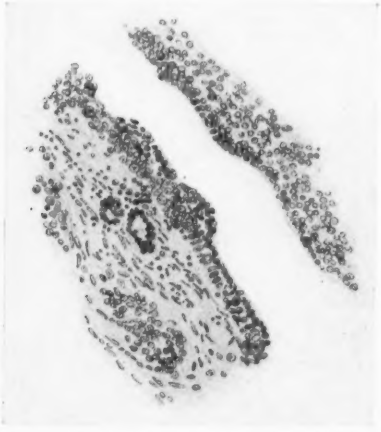

Fig. 12. (Drawing low power magnification) of region shown in *a*, Figure 11 with cross section of long tubule, and two thyroid-like tubules at side.

Fig. 11. Drawing of cross section of testicular tumor of Case 3 showing its mixed type of architecture. The inserts show the large round vesicular tumor cell on the one side, *a*, and two thyroid gland-like ducts with cartilage formation on the other, *b*. Between is a drawing of the lymph gland shown at the upper part of Figure 10 which has the same malignant structure as the tumor of the testicle.

enucleated from the scrotum and the cord divided, with Pacquelin cautery, as far up in the inguinal canal as possible. The specimen was sectioned and found on gross inspection, in consultation with Dr. Bartlett, surgical pathologist, University Hospital, to be a teratoma. (The gross appearance of these tumors after section is quite characteristic and the importance of being able to recognize testicular malignancy in the gross is evident, if the radical operation is to be performed at the time of castration. Search of the literature reveals nothing upon the surgical pathology of these tumors.) The patient was then turned on his left side and back with a pad beneath the costal margin very much as for a kidney operation and the radical dissection of the pre-aortic lymph area immediately performed as described above.

There was only one macroscopic gland found which lay upon the iliac vessel near that portion where the ureter crossed it. But no effort was made to find palpable glands and remove them singly. Rather was the whole endeavor one of clean complete dissection of the spermatic cord, lymphatics, blood-vessels, nerves, fascias, and fat with all ramifications out over the vena cava, aorta, ureter and the retroperitoneal muscles. There was a rather dense fibrous mass extending along the common iliac from the region where the ureter crossed to the bifurcation of the aorta and this was carefully dissected free from the blood-vessels beneath with the dissecting

Fig. 13. Photograph of patient, Case 3, two days before discharge from hospital. (Heavy scar appearance due to wound having just been painted with iodine.)

scissors. Stripping of the fascia, the lymphatics and the spermatic vessels along the vena cava above this point was very easily accomplished. At no time was there any extensive hæmorrhage. A photograph of the specimen removed is shown in Figure 6. The peritoneum was at no point penetrated. The patient's condition at the end of the operation was good. Convalescence was uneventful until the twelfth day, when the patient complained of severe pain down the left leg (operation on right side). There was marked tenderness over the femoral vessels and distention of the superficial veins with considerable œdema. There was no rise of temperature. Pain in the leg had practically disappeared in two days but the swelling persisted for several weeks. The patient seen in consultation by H. W. Allen. The condition was attributed to a phlebitis. He left the hospital at the end of three weeks and has been seen several times since then. The soreness in the left leg persisted for a short time but he has had absolutely no tenderness or soreness in the region of his incision (Fig. 7). There has been no abdominal relaxation and during his convalescence his bowels moved regularly and without the need of any special cathartics. The patient was shown before the San Francisco County Medical Society in March and was last seen on June 1, 1918. At this time six months since operation he was perfectly well. The slight stiffness of the left leg has entirely disappeared. He has been working for some weeks. There is no evidence of recurrence locally or retroperitoneally. The abdominal scar is in excellent condition. Pathologic report: teratoma testis, no metastases to gland area found.

CASE 2. R. B. W., age 30, referred by Dr. Craig, Lakeport.

A farmer with a good family and personal history who has lived all his life in California struck his left testicle against the horn of a saddle seven years ago.

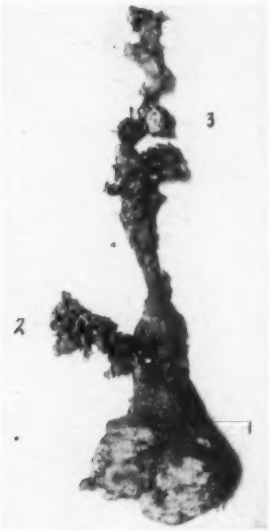

Fig. 14. Photograph of specimen of Case 4, which is a pure seminome, *1*, with metastases to large gland at *3*. *1*, Tumor and cord removed at first part of operation; *2*, lymph tissue and fascia from off iliacs and aortic bifurcation; *3*, tissues removed from pre aortic area with large gland about 2 centimeters below level of renal pedicle.

A short time afterward he noticed a small lump on the left testicle which gradually grew until within a year there was a mass twice the size of a normal testicle on this side. The condition remained unchanged until in April, 1917, when after rowing a boat it became painful, and it has since been slowly increasing in size, and is always painful after hard work. For a month there has been a fluctuant sac at the upper portion which has been tapped by Dr. Craig and considerable straw-colored fluid withdrawn. The sac quickly refills and becomes tense 3 to 4 days after tapping. A needle was thrust at the time of the last tapping into the solid lower portion with the discharge of only a few drops of blood. The patient is unusually strong and healthy and physical examination reveals nothing. The abdomen is negative. There is no tenderness nor masses. Reflexes are all active. Blood Wassermann is negative. In the left scrotum is a large ovoid mass 8x14 centimeters in size. The skin over the lower portion is reddened (probably by friction of clothes), but is everywhere freely movable over the mass. The upper portion is fluctuant and translucent and extends as a tense globular mass to the external ring. The vas can be felt at the back. It is not thickened and leads to a softer non-fluctuant mass at the base which appears to be a small remnant of the testis. In between is a third round, firmer, somewhat fluctuant tumor, the outlines of which are indistinct

Fig. 15. Drawing of tumor of Case 4 which is a pure seminal epithelioma and diffuses markedly in gross and macroscopic appearance from the tumors of the three preceding cases all of which are teratomata. Consists of hæmorrhagic and necrotic areas and of masses of active large vesicular cells as shown in inserts *a* and *b*.

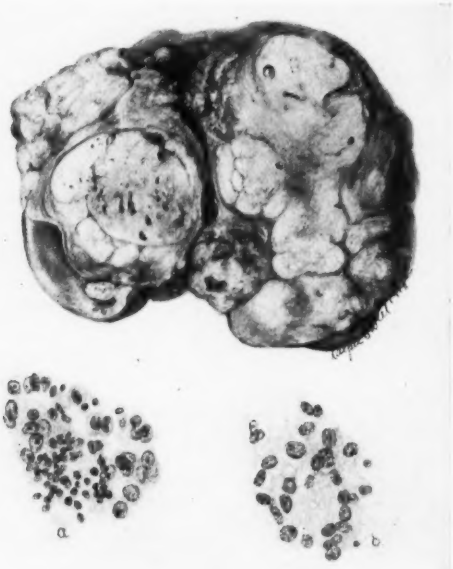

Fig. 16. Photograph of Case 4 taken October 4, 1918. Patient is on active duty in the army and has just received promotion to a majority; scar in excellent condition; no masses to be felt in the abdomen; no back or abdominal soreness.

because of fluid around it. A tentative diagnosis of hydrocele with either an epididimo-orchitis or teratoma was made. The absence of previous genital infection rendered teratoma likely. The patient was informed of the possibilities and his permission obtained for radical surgery if found to be indicated.

Operation, January 29, 1918. High castration. Cord dissected up into the external ring and divided with a cautery after ligation *en masse*. The testicle upon section showed macroscopically an appearance similar to that of Case 1. Dr. Rusk, the University Pathologist, confirmed the gross pathologic diagnosis of teratoma. The patient was immediately turned on his side upon a small pad and the radical operation performed. There were numerous lymphatic areas along the common iliac. The ureter was dissected free and held up by a tape and these glands with the spermatic vessels and all neighboring fascias cleanly dissected up along the aorta to the renal pedicle. A good exposure of the lower portion of the kidney and the kidney pedicle was obtained and there was an unusually large gland, just in the neighborhood of the renal pedicle which was carefully dissected free as shown in the insert (*b*, Fig. 5). The tumor, cord, glandular tissues and fascia removed are illustrated in Figure 8. There was very little hæmorrhage which was easily controlled and no injury was done to the larger blood-vessels. A long rubber tube was placed down alongside the aorta to its bifurcation and brought out at the back below the twelfth rib. The patient made a speedy and uneventful recovery. There was a slight superficial suppuration in the lower portion of the incision. The patient left the hospital on the twentieth day and has just recently been heard from (8 months after operation), and is apparently perfectly well. Dr. Craig saw the patient in July, 1918, when the photograph, Figure 9, was taken and states that his only complaint is slight stiffness in the left side after riding horseback all day.

Pathologic report. Teratoma testis with early metastasis in large lymph gland. Other tissues negative for metastases.

Case 3. W. C., age 36, American (M). The patient was born in Michigan, living there till 19 years of age; Philippines and China, 19-22; then California, Philippines, middle West and California, 31-36. He was in the army for about seven years. He has worked as laborer, cook, pipe-fitter, and general handy man. He has had measles, mumps (orchitis), malaria while in Philippines; being in the hospital 2 weeks. He has had a lame back recently. This was helped by use of arch supporters. He had an operation for hemorrhoids when 34. He has had no accidents. He had a neisserian infection when 20, with no complications. A second infection at 23 with complications. Lues: Chancre in 1903. Roseola. Two years of mercury by mouth and then nothing until 6 months ago when patient felt ill and went to a doctor who found Wassermann, 3+. Since then he has received courses of intramuscular and intravenous injections, apparently no arsphenamine. His habits are good. His wife had inflamed ovaries; no pregnancies; one child by previous husband.

Last March while at work the patient slipped and apparently strained himself. The right testicle, which had been atrophied since the patient had the mumps, became swollen and tender. Navy Hospital found Wassermann positive and he was discharged. He was given some desultory local treatment and the above mentioned anti-luetic treatment. The testicle has not grown appreciably since its first appearance.

Fairly well developed and nourished man. His hair was normal. Eyes: Pupils a a; regular reaction to 1 and d. Extrinsic muscles normal. Nose: negative. Mouth: teeth show marked pyorrhœa. Ragged tonsils. Neck: cervical adenitis of moderate degree. Thorax: well clothed. Moves equally on both sides and normally. Lungs: negative. Heart: not enlarged. Sounds clear and regular. No murmurs. P_2A_2 but not accented. Abdomen: negative. Spleen and liver not enlarged. *No masses palpable.* Genitalia: penis shows scars of chancre. Left testicle normal. Right testicle entirely replaced by a tumor mass the size of a goose egg. The mass is smooth, moves freely beneath the skin, is quite hard and not very tender. It does not transmit light and is not fluctuant. Reflexes: patellars hyperactive, Achilles positive.

July 16, 1918. A diagnosis of gumma of right testicle was made and the patient discharged for treatment and observation in outpatient clinic. July 23, patient re-entered the Hospital. Had received 0.6 arsphenamine at the clinic on July 18. Examination on re-entrance showed slight though definite increase in size of the tumor. Its character otherwise was unchanged. July 24, arsphenamine 0.6 intravenously. July 26, blood pressure 125/75. The probability of malignancy was explained to the patient and his consent to operation obtained.

Operation, July 27. An incision was made over the external inguinal ring, the spermatic cord and its accompanying vessels picked up and the tumor delivered from the scrotum. On section the tumor proved to be a teratoma of the testicle. The patient was turned on his side and the radical operation immediately undertaken. A large metastatic gland which was quite adherent to the vena cava was found just under the lower pole of the right kidney. Photograph of specimen removed is shown in Figure 10. Condition of patient on leaving operating room, fair.

July 28, patient feels very sore day after operation. The wound is clean. The drain has oozed considerable blood. August 1, rubber drain removed. August 4, stay sutures removed. Several small stitch infections were touched with iodine. August 5, stitches removed. Drainage at several points along incision. Wound was closing partly *per primam* and partly by second intention. General condition of patient good. August 14, condition of patient splendid. Wound almost healed. August 18, the patient is having pain over chest on both sides near clavicle and also over precordia. No dullness to percussion. A fine crepitus is audible on expiration over small area just mesad to left nipple. The pulse is regular but poorly sustained. The dressings were changed. A small bleb containing serum was opened and treated with iodine. August 24, the patient was discharged. His condition is excellent. The wound healed as shown in photograph, Figure 13. The patient is to report to clinic for antiluetic treatment. He was last seen in my office September 20, 1918, at which time he was in excellent condition, with no abdominal masses.

Pathologic report. Teratoma testis with extensive metastases to large lymph gland. Other tissues negative for metastases.

CASE 4. V. S. P., age 29, male, referred by Major Chidester. His health is excellent. He had pneumonia at 7, typhoid at 13, no operations. He denies venereal disease. About March 1, 1918 the patient noticed that the right testicle which was somewhat undersized up to that time started to grow rapidly to the size of a lemon and was diagnosed hydrocele. There was considerable dragging pain and it interfered with walking. He was sent, for hydrocele operation, to Dr. Chidester, who found a solid tumor upon exposure and on account of not having patient's consent did not do a castration.

Physical examination shows a man weighing 210 pounds; general condition good. Eyes: myopia 20/70; ears, normal; skin and mucous membrane negative; slight bilateral inguinal adenopathy; vascular system, negative; blood pressure, 122–80; heart, normal size, no murmurs, tones good; lungs, chest well formed, good resonance, no râles. Abdomen, negative, no masses palpable. Nervous system normal. Wassermann, negative. In the right side of the scrotum is a tumor about 7x10 centimeters involving testicle. It is hard, rounded, but presents no areas of fluctuation and does not transmit light. The skin over it is freely movable. Vas deferens is not thickened. Epididymis is localized at back of mass. Left testicle negative. July 14, 1918, he was given prevocative arsphenamine. Wassermann, July 20, 1918, again negative. The probabilities of tumor were explained to patient and consent to operation obtained.

Castration was performed through a high inguinal incision. The tumor was immediately opened and showed uniform transformation into tumor tissue with more or less extensive areas of hæmorrhagic necrosis throughout. It differed from all three former tumors in its soft, pulpy consistency and uniform greyish character.

No testicular tissue could be seen. Diagnosis of seminome was made and radical operation immediately undertaken. A very large gland was removed, as in the two previous cases, from the surface of the vena cava and aorta about 3 centimeters below the renal pedicle. This growth was quite adherent but was successfully removed together with all spermatic vessels fascia, fat, and lymphatics in one piece, Figure 14. It was in this case that the dissection was considerably helped by tying the spermatic vessels at points close to the aorta and renal vein and stripping from above downward to the adherent gland area to meet the previous dissection from below upward.

The patient made an absolutely uneventful recovery and was last seen in my office September 10, 1918. There were no abdominal masses palpable and general condition was excellent.

Pathologic report. Seminal epithelioma with extensive metastases to large lumbar lymph gland. Other tissues negative for metastases.

CASE 5.[1] E. S., age 30; plumber. Except for diphtheria as a boy, the patient has always been healthy. About the end of July or beginning of August, 1914, he struck his right testis with a hammer while at work. He became faint and sick but continued to work after a few minutes of rest. The testis was tender, but not swollen nor discolored. Within a few days it swelled up to about half its present size (that of a small fist), remained stationary for a month, then slowly grew to its present size. He has gained six pounds since the accident, feels well, but is alarmed over the swelling.

October 26, 1914. Examination shows a well built man. Internal organs normal. In the right scrotum there is a pear-shaped, soft, fluctuating swelling the size of a small fist, not tender, not translucent. The diagnosis of hæmatocele was made.

October 27, 1914. Operation at the German Hospital by Dr. Elloesser. A low inguinal incision under novocaine anæsthesia showed a smooth, soft, greyish-white tumor of the testicle, which was covered with dilated vessels. The cord was temporarily tied and the tumor incised. The section showed a greyish nodular tumor whose substance was interspersed with hæmorrhages. The diagnosis was made of a malignant tumor, and this having been explained to the patient a high castration was done. The cord was severed above the external ring at its entrance below the peritoneum. November 10, the stump of the cord is felt as a hard mass the size of a walnut leading up from which the cord is hard and the size of a lead pencil, suspicious of a carcinomatous infiltration. Re-operation is decided upon.

On November 20, the patient was re-operated upon, Dr. Rixford assisting. The incision follows the iliac crest from the upper end of the scar at the external inguinal ring to the lateral border of the quadratus lumborum. The peritoneum is separated from the posterior abdominal wall and the spermatic vessels, which remain attached to it, dissected from it. They are soft and seem normal. Careful examination of the vena cava and the aorta, and the territory between the ureter and the vena cava reveals but one small gland half the size of a bean, situated high up, where the vessels enter the right renal vein. The gland is extirpated and the vessels tied off below and above and removed. The patient is turned onto his back and the scar of the castration excised together with the adherent cord. From the infiltrated cord a nerve runs to the psoas muscle (spermatic branch of the genitofemoral) which is excised to its point of entrance into the muscle. The vas is resected to where it turns back of the bladder, about 2½ inches being removed. There was no bleeding from the retroperitoneum and but little oozing from the muscles. The exposure was excellent. The ureter appeared running through the fat, but was not touched. A small cigarette drain was placed behind the peritoneum and the rest of the wound closed in layers with silk and silkworms-gut. The incision was infiltrated with novocaine, and ether was given. The patient's condition after operation was surprisingly good until evening, when after an attack of vomiting he had a retroperitoneal hæmorrhage. He became alarmingly anæmic and his pulse rate remained high for weeks after. On November 27, the sutures were removed and about a pint of dark blood and blood clots were released from the wound. Following this there was some infection in the wound, but it finally healed without a hernia.

The patient has been examined repeatedly following operation; on January 28, 1918, he was in good health and working hard at his trade. He was shown to the County Medical Society in March, 1918. There is no sign of recurrence 3½ years after operation.

Pathologic report by Wm. Ophuls, Stanford: "Sections of tumor show tissue consisting almost entirely of very large round polygonal cell with large deeply staining vesicular nuclei. The masses of cells are imperfectly subdivided by thin connective-tissue partitions in which there are large blood-vessels. In sections from the proximal end of cord one finds in the vicinity of some of the nerves small accumulations of large cells which to my mind are very suspiciously like tumor cells."

As an illustration of the type of malignancy unsuitable for radical surgery the following case is reported:

CASE 6. Age 37; single. Two months ago the patient noticed that his right testis was beginning to swell. He had always noticed that the right testis was somewhat larger than the left one. The increase in size came on rather abruptly accompained by a slight dull pain. Growth was not associated with traumatism. At about the time that the testis began to enlarge, pain in left lumbar region often referred down into the scrotum was experienced. This pain is most severe when he is standing and disappears upon sitting down. During the last 2 weeks there has been occasional pain in the region of the left hip. There is no recent change in the appearance or size of the left testis. Sexual desire and power normal.

For the past 2 weeks nycturia (3–4) has been present, and within 2 or 3 days he has experienced considerable difficulty in voiding. There is no burning on urination; no incontinence. He has lost 25 pounds in last 2 months. His appetite is good, bowels regular.

Physical examination shows a well developed and fairly well nourished man. Ambulatory. He has

[1] I wish to thank Dr. L. L. Elloesser, San Francisco, for the notes of this case and his courtesy in allowing me to publish them.

dilated veins over cheeks. Scleræ negative. Mucous membranes negative. Hypertrophied submaxillary lymph glands. Posterior cervicals and epitrochlears palpable. Hair, scalp and nose negative. Pupils of eyes equal, regular, react to light and distance. Deaf in left ear. Teeth poorly kept. Tongue protrudes in midline without tremor. Chest well developed. Right chest more prominent than left. Movements equal. Lungs negative. Heart normal in outline, sounds good, quality, regular. No murmurs audible. Spleen not palpable, kidneys not palpable. Few dilated venules over cervical region. Prominence of ribs on left side. Immobility of lumbar spine on flexion, extension, and lateral movements. Extremities negative. Reflexes normal. In the right epigastrium can be felt large hard nodular masses, located midway between umbilicus and symphysis and extending under the border of the rectus. The glands on the right immediately at the external inguinal ring are large and firm. The superficial inguinal glands are small and the deep inguinals are not enlarged. Superficial inguinals are similar to those on right.

Genitalia: right side of scrotum is occupied by a hard tumor mass roughly cone-shaped, with the apex at the right external inguinal ring. The mass is not tender, nor lobulated nor is there any distinct separation of the mass into different portions, but there seems to be a slight change in contour at about its center. The skin is normal over it. No fluctuation present. Does not transmit light, cannot be reduced into abdomen. The epididymis is palpable and seems to be thickened. In the cord and about 2 centimeters from the mass is a small nodule 2 centimeters in diameter attached to the cord, not tender. Dimensions of the mass 12 centimeters long, 7.5 centimeters in width and 24 centimeters at its greatest circumference. Wassermann negative. *X-ray of epigastrium negative.* Prostate normal size. Seminal vesicles not palpated. Suggestion of a mass on right side, can just feel a slight fullness with tip of finger. Orchidectomy with removal of inguinal glands.

Diagnosis: mixed tumor right testicle with retroperitoneal metastases.

Condition of patient on discharge from hospital: There is still an open wound with some slough and discharge. The skin is somewhat reddened about it. The metastases (tumor masses) in the epigastrium remain about the same. The patient has lost 1½ pounds since entry. Discharged February 20, 1917.

Subsequent history: This patient was seen in the dispensary on several occasions during the next few weeks. He continued to lose weight and the abdominal masses gradually enlarged. Death occurred two months after castration.

Autopsy: Enormous metastatic tumor masses in the pre-aortic retroperitoneal space, and nodules in the liver and lungs with same histologic picture as testicular tumor.

Pathologic report. Mixed tumor of testicle, malignant.

It has been possible in each one of these five cases to perform a clean complete removal of the primary lymph zone of the testicle. No great operative difficulties were encountered. A large metastatic gland was removed from the surface of the vena cava in two of the cases with some difficulty on account of adhesions and numerous small blood-vessels. In Case 5 only was there an operative hæmorrhage that could not be immediately controlled.

Convalescence in each case has been practically uneventful. The only complication has been a phlebitis (Case 1) of the opposite leg which has cleared up completely.

These cases, furthermore, give definite and indisputable confirmation of Most's studies of the testicular lymph zone. In three cases (2, 3, and 4) an enormous lymph gland was removed from off the vena cava just below the renal pedicle. In each gland definite metastases were present. Careful pathologic study has failed to discover metastatic growth in other lymph, vascular or fascial tissues removed in these cases. Nevertheless the finding of tumor cells along the nerve trunks of the cord in Case 5 is most significant. The difficulty of microscopic recognition of early lymph metastasis is well known. And although no metastasis has been found in the tissues of Case 1, it does not necessarily follow that simple orchidectomy would have sufficed. Numerous lymph areas which correspond to the primary metastatic lymph zone, so well established experimentally and clinically, were removed. Their removal offers 100 per cent safety by Bloodgood's criteria. A cure in anyone of Cases 2, 3, 4 or 5 will have been due directly to the early and radical removal of metastatic growths. The pathology of these tumors and their metastases is of interest.[1] Only one (Case 4) is a pure seminal epithelioma (seminome), the other four being typical teratomata (teratome). The observation of Dr. Ophuls of tumor cell metastasis along a nerve trunk of the cord in Case 5 has special significance. This mode of transference has been long recognized as not infrequently occurring in tumors elsewhere, as in tumor of the jaw.

[1] It is proposed to give a detailed pathologic study of these tumors in collaboration with Drs. Rusk and Bartlet particularly with reference to their surgical pathology.

The coincidence of a strongly positive Wassermann in Case 3 emphasizes the necessity of close study of all testicular gummata and the wisdom of advising castration for purposes of diagnosis in all instances of doubt.

CONCLUSIONS

1, The radical operation for teratoma testis is justified in suitable cases by the high mortality following simple castration; by the definite experimental and surgical demarcation of the primary lymph zone, and by the possibility of the clean and complete removal of this zone.

2. The radical operation is neither technically difficult, dangerous nor mutilating as is proven by the fact that it has been successfully performed and the primary lymph zone completely removed in five cases of teratoma testis without a single troublesome operative or postoperative complication.

3. These five surgical successes indicate that the mortality from this seemingly extensive operation should be little if any greater than that following castration. All five cases enjoy perfect health now 9 months, 7½ months, 4 months, 3 months, 2 months and 3 years and 6 months, respectively, since operation.

4. The ultimate result in these five cases cannot be known for years. But the finding in four cases of metastatic tumor tissue in the lymph areas radically removed demonstrates the uselessness of simple castration and the necessity of radical surgery. A cure in any one of the four certainly, and possibly of the fifth, will have been directly due to the early and clean removal of the gland-bearing area.

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SPLENECTOMY IN DISEASES OF THE SPLEEN

Reporting Four Operative Recoveries

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OF the many diseases which seem to depend on some disordered secretion from the spleen, none is more interesting than Banti's disease: (1) because its pathology is not understood and leaves a wide field for speculation and a wider one for experimental study; (2) because, while we are not familiar with the pathology of this condition, we do know how this condition may be relieved. The results from surgical interference are all any one could wish for from any surgical operation. The mortality in this condition is, or should be, almost nil, if the case is properly studied and the proper measures are carried out for the protection of the patient before and during operation. When the patient is very anæmic, one should not hesitate to obtain a suitable donor and give the patient a liberal blood transfusion by one of the methods now in use. Personally, I prefer the use of the whole unaltered blood, either by the direct anastomosis of the vessel from donor to recipient, or by the use of Kimpton-Brown tubes. The latter has been much more satisfactory in my hands. It is almost needless to add that the donor should be examined with great care to ascertain that he is free from transmissible diseases.

The use of nitrous oxide anæsthesia in this condition is also a very important part of the technique, for it has been so thoroughly proven that the hæmolysis seen often after the use of ether as an anæsthetic, and the reduction in hæmoglobin, is never seen after the use of nitrous oxide. Also for the past five years I have used a slight mixture of pure CO_2 gas, prepared by the Ohio Chemical Company, with the gas oxygen. This accomplishes two purposes: (1) stimulates the patient, and (2) stimulates the respiration. This was suggested to my mind after hearing a most excellent talk at the Academy of Medicine in New York by Yandall Henderson, who had gone deeply into the subject of carbon dioxide as a stimulant. He reported several cases in which it seemed he had succeeded in almost bringing the dead again to life, by the proper use of CO_2 gas. I have found it exceedingly valuable in anæsthesia.

The operation of splenectomy is usually not a difficult one, although if there are adhesions present and the organ is a large one, it may cause some anxiety to the surgeon before he has finished the operation. If the pedicle is a very short one, it will add materially to the difficulty of the operation, just as will the same condition when encountered in nephrectomy.

The splenic artery may be ligated separately, also the veins one finds in the pedicle. I first ligate the pedicle *en masse*, and then, after removal of the organ, ligate separately the vessels, which may readily be picked up after the organ is severed. I use heavy catgut for all ligations, and have never had cause to regret its use.

The operator should be exceedingly careful not to injure the pancreas, diaphragm, colon, and stomach, as it is possible by rough handling to injure any one of these organs.

Unless there have been many adhesions broken up, accompanied by some oozing, which cannot be entirely controlled, drainage is unnecessary.

The reports of the following four cases, I think, are of interest, because two of them I have been able to follow up for ten years. One of the remaining two I have been unable to locate after one year. The last one is a recent case, of only a few months. In some respects the blood after operation, has presented many of the usual phenomena reported by other operators; in some other respects it had differed materially.

Case 1. F. D., male, age 26 born in Sicily. The family history is negative. The patient had been a farmer by occupation, a hard worker, and had never used alcohol. He had always been a

Case 4. Spleen 15½ by 19¼ inches. Weight 13½ pounds.

hearty eater. He came to America two years ago. His past illness consisted in periodic attacks of malaria. As a young man in Sicily he had a spell of fever lasting about four weeks. Six years ago he was rejected by military authorities in his native country on account of a large tumor in the left side. Up to this time the patient says he knew nothing of the existence of the tumor. He thinks he had smallpox at 19 years of age. The patient thinks he has been growing weaker for years, but only consulted a doctor two months ago for severe pain in the left side over the region of the tumor. This pain would run upward toward the left shoulder. The bowels moved regularly. He has had occasional hæmorrhages from the bowels which he supposed to be "internal piles," also one or two severe hæmorrhages from the lungs, or stomach. On examination the patient's lungs and heart were found normal. The liver was very slightly enlarged, and freely movable. There was no tenderness over the gall-bladder or appendix. The kidneys were not tender, and both could be located in the proper place. A large mass was felt in the left hypochondriac region which also extended deeply into the left lumbar region. The mass could be seen to glide under the anterior abdominal wall on deep inspiration and expiration, but seemed to be firmly fixed posteriorly, and was quite tender on palpation and percussion. The urine was negative. Taking into consideration the blood picture and history, a diagnosis of Banti's disease or splenic anæmia was made and operation advised.

Operation. Gas-oxygen anæsthesia was used. An incision about 8 inches long was made beginning under the costal margin near the ninth costal cartilage and extending downward and outward for about eight inches. The enlarged spleen was exposed.

Externally many adhesions were found to exist between this organ and the abdominal wall. The adhesions throughout were found to be plentiful and the bleeding very troublesome as every denuded area seemed to weep blood. Where the adhesions were broken up between spleen and lateral abdominal wall it became necessary to leave in two hot abdominal packs in order to control the oozing.

His convalescence was uneventful except for two elevations of temperature due to the formation of stitch abscesses.

The spleen weighed 56 ounces. The report of J. S. McLester on the pathologic findings is appended:

"The organ is firmer than normal, cuts very hard, is normal in color, and has a greatly thickened capsule.

"In the interior of the organ is a cavity about the size of a hen's egg. Smears made from the contents of this cavity show softened splenic pulp and pus. Cultures made from this pus gave the typhoid bacillus in pure culture. This organism was identified by E. M. Mason, State Bacteriologist.

"Microscopic sections made from the organ show great increase in the size and number of the fibrous trabeculæ. The fibrous framework seems to be enormously hypertrophied. The parenchyma cells are increased in size and number, and the glomeruli can be distinguished only with difficulty. Irregularly defined patches of pigmentation are seen. There seems to be some swelling and proliferation of the endothelial cells of the cavernous veins.

"Diagnosis. Chronic interstitial splenitis."

The following blood picture of this case is interesting:

Examination of blood before operation. August 23, 1909: White blood count 1,700, red blood count 2,400,000, hæmoglobin 50 per cent. August 26, 1909: white blood count 1,800, red blood count 2,100,000, hæmoglobin 45 per cent. Blood pressure 115. Malaria, negative; Widal, negative.

Unfortunately the record of differential count before operation was lost, therefore, it cannot be given accurately and is omitted from this report.

Examination of blood after operation. August 28, 1909: white blood count 1,700, red blood count 2,850,000, hæmoglobin 60 per cent, polymorphonuclears 64 per cent, large mononuclears 7 per cent, small mononuclears 12 per cent, eosinophiles 17 per cent. Blood pressure 95. September 1: white blood count 25,800, red blood count 2,940,000, hæmoglobin 70 per cent, polymorphonuclears 68

per cent, large mononuclears 11½ per cent, small mononuclears 6½ per cent, eosinophiles 14 per cent. Blood pressure 120.

September 3: white blood count 12,000, red blood count 4,000,000, hæmoglobin 70 per cent, polymorphonuclears 88 per cent, large mononuclears 4 per cent, small mononuclears 4½ per cent, eosinophiles 3½ per cent. Blood pressure 115.

September 11: white blood count 14,000, red blood count 4,200,000, hæmoglobin 75 per cent, polymorphonuclears 72 per cent, large mononuclears 5 per cent, small mononuclears 20 per cent, eosinophiles 3 per cent.

September 15: white blood count 17,500, red blood count 4,240,000, hæmoglobin 75 per cent, polymorphonuclears 71 per cent, large mononuclears 7 per cent, small mononuclears 18 per cent, eosinophiles 4 per cent.

September 30: white blood count 14,000, red blood count 4,520,000, small mononuclears 14 per cent, eosinophiles 2½ per cent, hæmoglobin 85 per cent, polymorphonuclears 74½ per cent, large mononuclears 9 per cent.

October 10: white blood count 8,000, red blood count 5,000,000, hæmoglobin 90 per cent.

At this time (April 15, 1910) about eight months since operation the patient is in perfect health, has gained 53 pounds in weight and is at work as a day laborer.

The foregoing report was made at time of operation. This patient reported to me several times per year, for seven years, and he was still engaged as a day laborer and his health was good. Several blood examinations during this time showed his blood picture to be practically normal.

Case 2. Splenic anæmia. Mrs. T. J., white, aged 26, married, American born, entered the infirmary November 5, 1911. Her father died when quite old of some unknown cause. Her mother died of "congestive chill." Two brothers are dead; one died in infancy, the other through accident. She has eight sisters, all living and in good health.

The patient had jaundice when 4 years old, and a second attack two weeks previous to entrance into infirmary. She does not think she ever had a spell of fever of any kind except following the birth of both her children. Menstruation began at 14 years. It was regular, scanty and lasted for only one or two days, at this time she suffered quite a little pain. She had been married about five years, and is the mother of two children, the oldest being 3 years of age, the youngest 1 year. The labors were normal but were followed by infection each time, which confined her in bed several weeks.

The present illness began five years ago with vomiting of blood, which was about half a cupful. The blood vomited was very dark red. Since this time she had vomited blood almost daily in small quantities up to October, 1910, and since then about once a month. She suffered no pain; the appetite was poor. The bowels moved from three to five times daily; there was no blood in the movements. She suffered from nausea, headache and vertigo. She said her temperature was usually elevated in the afternoon. She had no cough.

Examination revealed a very frail, anæmic woman whose skin showed a marked icteroid hue, and one would think she had lost much flesh during the past few months. She said her weight now was 90 pounds, and that she had lost 25 pounds during the past year. Her lungs and heart were found to be negative. She had no enlarged glands in the neck. The thyroid was not enlarged. The tongue was very pale, and the gums and lips showed a marked anæmia. The liver was uniformly enlarged but was freely movable on deep inspiration. The abdomen was very much distended by a large tumor which occupied the left hypochondriac region, part of the epigastric, lumbar and the umbilical regions. The tumor was slightly tender from pressure and was fixed posteriorly. The inguinal glands were not enlarged. The patient's feet and ankles showed marked œdema.

Vaginal examination revealed a retrodisplaced and fixed uterus which was quite tender. The urine showed a trace of albumin; otherwise it was negative. Blood examination November 5, 1911, revealed: white blood count, 5,850; red blood count, 1,776,000; hæmoglobin, 25 per cent (Sahli); color index, 0.89. Differential count revealed small lymphocytes, 30.6 per cent; mononuclears, 20 per cent; polymorphonuclears, 43.6 per cent; eosinophiles, 2.3 per cent; mast cells, 0 per cent; myelocytes, 3.5 per cent. On account of the long period of years covered by illness, the hæmorrhages, etc., a diagnosis of chronic splenic anæmia, or Banti's disease, was made and the patient was advised to stay in the infirmary in order to see if she could not be gotten in better condition for operation. She did not improve but seemed to grow worse.

Blood examination, November 20, 1911, revealed: white blood count, 5,400; red blood count, 1,520,000; hæmoglobin, 19 per cent (Sahli instrument used). Color index, 0.65. Differential count revealed: small lymphocytes, 22 per cent; mononuclears, 20 per cent; polymorphonuclears, 56.5 per cent; mast cells, 5 per cent; myelocytes, 1 per cent.

The patient was dismissed from the infirmary as an inoperable case, November 26, 1911, a blood examination on this date showing the same as on the 20th. She returned home, and under treatment improved to some extent and was returned for operation, March 17, 1912. Her condition at this time was not good, but was somewhat more favorable for surgical interference. The blood examination at this time revealed: white blood count, 4,500; red blood count, 2,500,000; hæmoglobin, 45 per cent. Her temperature on admission was normal, pulse 78, volume poor. The urine contained albumin. She was prepared for operation for the

following morning, and under nitrous oxide and oxygen anæsthesia the large spleen was removed. It weighed 48½ ounces. Many adhesions were encountered and the bleeding gave some trouble, but the patient left the operating table in good condition. The temperature rose at once to 103.8°, pulse 132, but they both came down to normal in a few days. For some days the patient would have a distinct rise of temperature, but the pulse remained normal or nearly so, even when one of the sharp rises of temperature would indicate that we had trouble.

The blood picture after operation was interesting. The examination was by Dr. McLester.

Blood counts. March 21, 1912: white blood count 11,200, red blood count 11,900,000, hæmoglobin 45 per cent. Differential count, 500 cells counted: polymorphonuclears 75 per cent, small mononuclears 9 per cent, large mononuclears 3 per cent, eosinophiles 12 per cent, transitionals 0.3 per cent, nucleated reds 0.4 per cent, basophiles 0.3 per cent.

March 29, 1912: white blood count 18,000, red blood count 3,000,000, hæmoglobin 55 per cent. Differential count, 500 cells counted: polymorphonuclears 78 per cent, small mononuclears 15 per cent, large mononuclears 1 per cent, transitionals 1 per cent, eosinophiles 5 per cent.

April 8, 1912: white blood count 37,700, red blood count 3,500,000, hæmoglobin 70 per cent. Differential count, 500 cells counted: polymorphonuclears 86 per cent, small mononuclears 11 per cent, large mononuclears 1 per cent, eosinophiles 2 per cent.

April 15, 1912: white blood count 17,000.

April 20, 1912: white blood count 10,000.

The characteristic blood findings in splenic anæmia are a leukopenia and anæmia of the secondary type.

The patient was dismissed from the infirmary, April 14, 1912, very much improved.

January, 1913, a report from the patient was to the effect that she had gained about 30 pounds and that her health was perfect.

Pathologic report by Dr. James S. McLester: "The spleen weighs 48½ ounces and measures 10¾ by 6½ by 3½ inches. Its surface is smooth and glistening and is perhaps a little darker in color than the normal spleen.

"The fibrous capsule is very much thickened. The cut surface shows very distinctly the fibrous trabeculæ. Microscopic examination shows that the capsule is greatly thickened and that there is some, though not marked, increase of the fibrous reticulum.

"No proliferation of the endothelial cells can be noted. The malpighian bodies, while smaller than usual, are well preserved.

"The most striking feature of the microscopic picture is the great number of eosinophiles. These cells are very frequent and are scattered evenly throughout the tissue. An average of about eight is seen to the field (section of 6 to 8 microns, Winkel 3 millimeters objective and No. 3 ocular)."

The great number of eosinophiles, suggests Hodgkin's disease. On the other hand, the clinical history, the complete absence of glandular enlargement elsewhere, the increase in the fibrous elements and the absence of endothelial growth point to the splenomegaly seen in Banti's disease. In the light of our knowledge, I think we are forced to place this spleen in the latter class.

This case I followed for a short time, and she recovered entirely, but I was unable to get her to ever return to the infirmary for examination. If this case was again to be handled by me, I would certainly give one or more blood transfusions, but at the time this case was operated upon we were not using blood transfusion. I think it unusual this case recovered, as she was certainly a poor operation risk.

CASE 3. Female, age 29. Complaint, large mass in left side and general bad feeling. The family history is negative. The patient has been in poor health for past five years or longer. She had jaundice when five years old. She had hæmorrhage from bowels in 1914. She sleeps poorly and has lost 18 pounds during the past year. She noticed a mass in the left side five years ago and this had continued growing since that time. She is the mother of five children, the youngest 2 years of age. She menstruates every 28 days, very profusely. Upon examination we find a frail woman weighing about 100 pounds. She looks anæmic and quite weak. Her chest is negative with the exception of a regurgital murmur, though this is fully compensated and seems to be giving no trouble.

Abdominal examination reveals a large tumor in the left hypochondriac region which could be readily recognized as the spleen. There were no enlarged glands about the body. The temperature and pulse were normal.

The blood examination shows: white blood count 6,000, red blood count 2,850,000, hæmoglobin 50 per cent. Differential count showed: small lymph 30 per cent mononuclears 20 per cent, polymorphonuclears 44 per cent, eosinophiles 3 per cent, myelocytes 3 per cent.

The urine was negative.

The diagnosis of Banti's disease was made in this case and operation advised. Nitrous oxide-oxygen anæsthesia was used and a spleen weighing 58 ounces was removed. The operation was quite easy as no adhesions were encountered and the pedicle was of sufficient length to permit of its easy delivery. The patient made an uninterrupted recovery and returned home on the fourteenth day. The report from her from time to time was that she was constantly improving, and fourteen months

from the time of operation I received from her husband a letter from which I quote: "You will probably be interested to know that we had a 7½-pound boy born last night. Baby and mother doing well. Mrs. H. is enjoying better health now than she has in seven years, etc."

She remained in fine health until the latter part of 1917, when she committed suicide by shooting herself. Cause of act unknown as she seemed well and happy.

CASE 4. Male, age 38. Occupation, farmer and coal miner. The patient complains of very large tumor in the left side. The family history is negative. The past history is negative, except for an attack of jaundice in 1898. He has always been healthy until six years ago, when he first noticed this tumor.

At the present time he complains of dyspnœa and palpitation of the heart. He says he has spit blood several times. He has lost much weight; he thinks about 30 pounds during the past year.

Upon examination his chest is negative. There are no enlarged glands anywhere about the body. A very large tumor can be felt that fills the entire abdomen, but one can make out the splenic notch and it seems to be the spleen. The white blood count is 2,100; red blood count 2,825,000; hæmoglobin 60; polymorphonuclears 66 per cent; small lymphocytes 27 per cent; large lymphocytes 6 per cent; basophiles 1 per cent. The urine was negative.

The diagnosis of Banti's disease was made and patient operated upon the following morning. Gas-oxygen anæsthesia was used. Owing to the size of the tumor and shortness of the pedicle it was quite a difficult operation. Some adhesions were encountered, which bled rather freely when they were severed. The patient left the operating table in good condition and made an uninterrupted convalescence. The spleen weighed 13½ pounds after all the blood was permitted to flow out. The blood from the organ weighed several pounds. I think this one of the largest spleens recorded.

The blood picture following operation is as follows:

June 10; white blood count 16,000. hæmoglobin 75 per cent, polymorphonuclears 74 per cent, small lymphocytes 18 per cent, large lymphocytes 7 per cent, basophiles 1 per cent.

Blood counts made daily after June 10, changed very little up to the time he was discharged from the infirmary. The hæmoglobin was decidedly improved and the last reading on chart was 85 per cent.

This was unusual as we are supposed, according to some observers, to have a decided reduction in hæmoglobin following splenectomy.

The report on this patient at the present time is that he is in excellent health.

The pathological report made by M. C. Winternitz is as follows:

"The specimen of spleen was sectioned. There is no marked increase of fibrous tissue and, as usual in a spleen that is greatly increased in size, the malpighian corpuscles are few and small. The sinusoids are everywhere distended and contain a much larger proportion of red blood cells than any other type. The walls of the sinuses are definitely thickened and the endothelial cells are more prominent than usual. The pulp is very cellular, the cells are chiefly mononuclear in type.

"I do not find anything specific in the spleen to indicate a special disease and this, of course, is in accord with the diagnosis you have made of splenic anæmia. Whether this could be considered a Banti spleen is a question that is open."

DEPARTMENT OF TECHNIQUE

GYNECOLOGICAL PELVIC DRAINAGE

Indications, Methods, and Materials[1]

By J. WESLEY BOVÉE, M.D., F.A.C.S., Washington

THE subject of employment of drainage in intraperitoneal pelvic surgery has provoked many heated discussions dating back as much as forty years. I shall not take up the relative value of capillary drainage (said to have first been used by Heister[2] in the eighteenth century) and tube drainage, though that subject is not without interest. The glass tube drain through the abdominal wound was employed in practically all operations not excepting those conditions constituting what are now called clean ones. But when one reviews the technique of intraperitoneal operations of forty years ago, it is not difficult to understand that the surgeon dreaded to close the abdominal wound completely. Kelly's clinic in Johns Hopkins Hospital showed that infection was introduced through the tube in the postoperative treatment and the use of the glass intraperitoneal drainage tube was gradually lessened. It was succeeded by the Mikulicz drain, and that by an effort to avoid drainage. The question as to whether drainage should be employed, as the practice of cleanliness and careful technique became more universal, received marked attention. The trend of the times since has been to avoid drainage to the utmost degree possible. Greater confidence in the capacity of the peritoneum to care for its injuries has been established in our profession, and some, notably, Robert Morris, of New York, have announced their preference to leave within the peritoneum pus found there, because of its food value. I am prompted at this juncture to repeat my statement to the Medical Society of Virginia,[3] in 1902, that I believe the wise pelvic surgeon never drains in clean surgery, very rarely in dealing with the late results of infectious inflammations, and very frequently when dealing with such processes in an early stage. But aside from the dangers of peritonitis and other evils that may arise from infectious materials in the pelvic portion of the peritoneal cavity there is a very common and serious condition: a peritoneal denudation, arising from the separation of pelvic adhesions in pelvic surgery. Ofttimes quite large areas of the pelvic peritoneum are denuded, and to cover them with peritoneum is often found impossible. It is with special reference to this condition that I will consider this subject a little farther along.

I believe no one will gainsay that dependency is advantageous in drainage, as serum, pus and most fluids will tend to gravitate. Therefore, for drainage of the female pelvis the vaginal route is always preferable to the abdominal. Nor is gravitation the only point of advantage of the lower route. I have not in many years seen a woman's pelvis drained through the abdominal wall that I did not think she had been unfortunate in the selection of her surgeon.

For the employment of vaginal drainage from the peritoneal cavity, I believe we are indebted to E. R. Peaslee, who, in February, 1855, after removing an ovarian tumor complicated by ascites, passed a gum elastic catheter *per vaginam* into Douglas' pouch, which was retained thirteen days.[4]

Of the many materials used for pelvic drainage, cotton gauze and rubber are by far the most commonly employed, the rubber tube or gauze for small areas and a combination of them for larger areas. Many favor the cigarette drain of a layer of thin rubber enclosing sterile or medicated gauze or rolled with the gauze. A thin rubberized paper is often substituted for the rubber. It has been claimed that such materials have at times not acted as a drain, but in an opposite way, i. e., plugged the opening into the vagina and caused an accumulation of fluid above them that found an exit through the abdominal wound, thus weakening or possibly infecting it. In 1912[5] I exhibited to the American Medical Association

[2] See Bryant and Buck. American Practice of Surgery, 1,761.

[3] See its transactions, page 199.

[4] Am. J. Obst., N. Y., 1870, iii, 300-318.

[5] J. Am. M. Ass., 1912, lix, 240-251.

[1] Presented before the Southern Surgical Association, Baltimore, December 17-19, 1918.

a rubber drain I had devised and employed for several years in pelvovaginal drainage. It consisted of a triangular piece of thin rubber, usually taken from a condemned rubber glove and attached by its narrow base to a soft rubber round rod about ¼ inch in diameter and two and a half inches in length. This bar was made to rest on the uterosacral ligaments and the thin rubber, about 4 inches in length protruded into the vagina. The lowest angle of it could be grasped with a forceps introduced through the vulva, and the whole of the drain easily and painlessly withdrawn. Ofttimes plain gauze was brought down behind it when extra covering of denuded peritoneal areas was desired. Until March, 1916, when I began the use of the paraffine-stearine gauze for this purpose, this rubber drain was used with a high degree of satisfaction, though at times its withdrawal was notably painful to the patient.

Hart E. Fisher[1] used plain surgical gauze, surgical cotton, chamois skin, gutta percha tissue, silver foil, paraffine or oiled paper, rubber dam (dental), narrow mesh fine silver wire screen, medicated gauze dressing, cold cream, and powder dressing, and he concluded that plain gauze soaked in equal parts of stearine and paraffine was perfect in its non-adhesive property and could be placed against the denuded tissue and covered with other (plain) gauze to absorb discharges coming through the special gauze, without adhesion of the dressing to the wound.

In cases in which, in the course of several days, the plain gauze was several times changed without disturbing the paraffine-stearine gauze no adhesion occurred.

His method of preparing this gauze follows:

> Paraffine wax is brought to the boiling point at three different intervals in the course of an hour and filtered through a narrowly meshed gauze. It is thus sterilized and freed from any foreign bodies such as minute particles of grit, etc.
>
> During this procedure the stearine (stearic acid) is brought to the boiling point and filtered by the same process and for the same number of times. Then equal parts of the liquid-hot paraffine and liquid-hot stearic acid are poured into a white porcelain container, again brought to the boiling point, and filtered as described above. The mixture is then ready for the sterile, wide meshed gauze, cut in sizes to suit, which is immersed in it for ten minutes to allow the gauze to become thoroughly impregnated with the fluid. The wet gauze is then removed and stretched, and the excess of mixture allowed to drain off. A jet of filtered and heated air is directed against the gauze, causing the film of wax over the meshes to melt and allowing a more uniform waxed screen. When dried the gauze is placed in a sterile container and sealed.

I have had this gauze made by this formula and again the feature of blowing hot filtered air through has been omitted, thus avoiding a very troublesome feature and as well a possible danger of contamination. The product of the curtailed process was not as smooth though by breaking it slightly when applying it no practical defect has been noticed. The pieces should be originally cut small as often but small areas are to be covered and the difficulty in making this gauze would emphasize the necessity of greater economy in its application. Parresined lace-meshed dressing, prepared by one commercial laboratory is stiffer and coarser meshed. I have used it but the meshes are too large. However, it is a fair substitute for Fisher's paraffine stearine gauze.

For two and a half years, since reading Fisher's article, I have been using Fisher's gauze for vaginal drainage from the pelvic peritoneum. It has been used largely as a casing of one or two layers surrounding plain gauze. I soon learned to suture the casing to the core of plain gauze, for in one patient the interne, Dr. Kane, removed 8 inches of the 24 inches of gauze on each of the third, fourth and fifth postoperative days. To our surprise, 3 days later the patient expelled the 24 inches of the paraffine-stearine gauze.

In a fair proportion of the work a roll of the latter gauze was used without the plain gauze core. The employment of this material for pelvic peritoneal drainage has been so satisfactory that I have adopted it to the exclusion of all other materials for this purpose. In one instance the interne was about to remove one-third of a strip of this material, 24 inches in length, on the third day after operation, from a very nervous patient. Becoming greatly excited she strained and expelled in a serpentine shape the whole of it before he could get hold of it or get her to desist from straining. These two instances tend to confirm the statement that it does not adhere to the tissues.

On applying this gauze it will be thought its rigidity renders it inappropriate, but the temperature of the body readily softens the material, causing it to mold itself as smoothly as plain gauze. This gauze, then I feel may be relied upon to protect denuded pelvic peritoneum for a sufficiently long period of time for endothelialization under it to occur, thus avoiding the much dreaded adhesions of intestine and omentum to such denuded areas; also while affording disposal of any accumulated fluids may also be itself removed at any elected time.

I may add I have had opportunity to view several months subsequently a few of the pelves thus drained and in none of them were pelvic adhesions present.

[1] J. Am. M. Ass., 1916, lxvi, 939.

RECONSTRUCTION OF THE UTERUS[1]

By CHARLES R. ROBINS, M.D., F.A.C.S., Richmond, Virginia
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THE desirability of preserving the generative organs in women during their functionating period, particularly in young unmarried women, admits of no argument. The difficulties which beset conservatism, however, when the uterus is the seat of a growth of which fibroid tumors are the predominating type, are very great and often insurmountable. Fibroid tumors in the body of the uterus are almost invariably multiple and the distortion and deformity are so great that conservatism in the large majority of cases is out of the question. In addition, knowing that fibroids are multiple and that they grow from very small islets, the presence of palpable tumors simply indicates that others are probably present which cannot be felt, and that although the recognized tumors may be removed, others will probably develop. However, the anatomy of the uterus is particularly favorable for resection. The blood supply and the tubes entering from the sides enable us to remove whatever of the middle portion of the uterus may be desired or deemed advisable. The only things necessary are the blood supply, tubes and a continuous uterine cavity. Not all cases, however, are suitable for conservative treatment, and where the deformity is very great or the fibroids generally distributed, a conservative operation is most often impossible. Neither is the operation indicated in all cases, even when the anatomical problems may appear to be suitable. In women who have borne children and who are approaching the menopause and in whom sexual life has been satisfied, removal is undoubtedly the best operation. It is safe, the results are excellent and there remains no reason for further operation as far as the uterus is concerned. The advantages of conservatism are overborne by the prospect of further pathology.

There remains, however, a class of cases in which the opportunity for matrimony or of bearing children is a matter of such great importance that some risk is justifiable. There also remains a class of cases in which the exact pathology remains a matter of doubt, notwithstanding that every effort has been made to arrive at a diagnosis. In such cases, as has been pointed out by Deaver[2] in a most admirable paper entitled, "Anterior Transperitoneal Hysterotomy," the exact condition can be definitely determined by incising the uterus through the abdominal route and directly inspecting the interior. By this apparently radical procedure, it is possible in a number of cases to practice the greatest conservatism and if necessary to resect the uterus.

The operation which is contemplated in this paper is the bold resection of the diseased or tumor-bearing portion of the uterus and the reconstructing of the uterus by uniting the lateral portions that are left. It has many advantages over myomectomy, which is the operation with which it would most frequently be contrasted. In the first place it would save a considerable amount of time. It is far easier to resect the uterus than it is to attempt to shell out the tumors particularly if they are numerous. It would have the advantage of enabling us to inspect the uterus, both from within and from without. In that way we would be most likely to remove all of the fibroid nodules. It is much easier to secure a normally shaped uterus where the incisions are carried along lines that will secure the best apposition. It must undoubtedly be a safer operation because we do not have the numerous pockets to obliterate, and consequently there would be no dead spaces and areas for infection. The operation is a safe one because when completed there remains only a suture line which is hardly likely to give any trouble. The dangers of future rupture of the uterus, should pregnancy occur, I believe, are negligible.

I wish to report two cases in which this operation has been performed.

Case 1. Register No. 18–389. This patient was seen June 6, 1913, and at that time presented the following history. Age 36, white, female, single. The patient was contemplating matrimony. She had suffered all her life with nausea and had had pain all through the lower abdomen and at times became very sore in the suprapubic region. In the last eighteen months her flow had been irregular and for the last two or three months it had a tendency to check. She also suffered from sick stomach and indigestion. On examination she was found to be tender in the right iliac region and the uterus was markedly retrodisplaced and somewhat enlarged. At operation she was found to have a chronic appendicitis, which doubtless accounted for some of her symptoms, and in addition to the retrodisplacement of the uterus the fundus contained a fibroid together with a fibrosis which caused a marked thickening and hardening of the fundus of the uterus. In

[2] Deaver, John B. Anterior transperitoneal hysterotomy. Surg., Gynec. & Obst., 1914, 424.

[1] Read before the Southern Surgical Association, Baltimore, December 17-19, 1918.

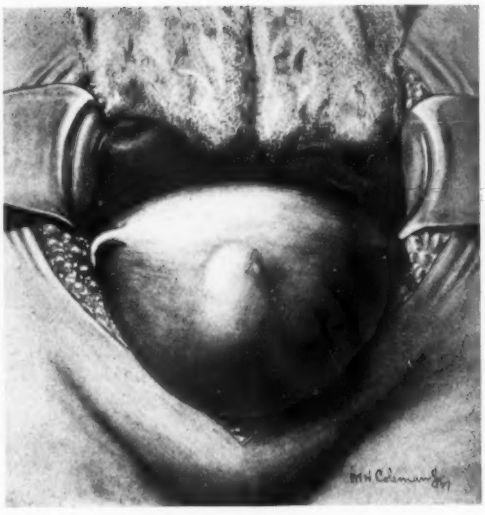

Fig. 1. Case 2. Showing enlargement of uterus and elevation of fibroid. The fibroid is somewhat accentuated in this drawing as it really did not appear above the surface.

Fig. 2. Case 2. Showing tumor removed by elliptical incision and sutures for approximation introduced.

view of the fact that the patient was contemplating matrimony and on account of her earnestly expressed wish not to have any of her organs removed, it was determined to resect the affected portion of the uterus instead of performing a hysterectomy. This was further indicated because it was deemed advisable to clear up the pathology by securing the affected portion of the uterus for microscopic study. The resection was done by making a double V incision extending down as far as the internal os anteriorly and posteriorly. The endometrium was found to be very much thickened and fungous. This was curetted through the incision. The lateral portions of the uterus that were left were sutured to each other with interrupted sutures of Pagenstecher. The patient made an excellent recovery and was subsequently married and became pregnant. She, however, aborted at about four and half months. A year later she became pregnant again but aborted at the end of one month. However, in July, 1918, five years after the operation she was delivered of a robust full term infant without any pathology either during the pregnancy or at time of birth.

Case 2. Register No. 22–550. This patient was seen August 29, 1917. Age 24, white, female, single. She gave the following history. She sought relief on account of a flow of blood from the vagina. Her periods commenced at fourteen years and at first she had no trouble except a tendency to go over time and a very slight dysmenorrhœa. Her periods had always been free and would last four or five days. About three or four years ago she began to suffer with indigestion, and a year later was taken with an acute attack of pain in the right iliac region and vomiting. Previous to this she had had a good many spells which were similar and which she says usually came on with her periods. She was finally operated upon and the appendix removed about two years previous to the time she consulted me. About six hours after the operation her flow came on, which was at the usual time, and she suffered considerable pain in the lower abdomen. After leaving the hospital she suffered with more pain at the time of her periods and the flow increased. Eight months previous to consulting me she had had a continuous flow for about a month and had been taken to the hospital and curetted. This, however, did not afford any relief and she continued with an irregular flow, which at times was very profuse, and on entering the hospital she presented every appearance of a person suffering from a profound anæmia. On examination her abdomen was negative. On bimanual examination the fundus of the uterus was found retrodisplaced, but no irregularities in the contour of the uterus could be detected. In view of the fact that the patient had been curetted without relief, it was determined to perform a laparotomy and explore the uterus through an incision. When the uterus was brought up a fibroid nodule could be palpated in the anterior wall, which was evidently extending into the cavity of the uterus. The tumor was removed by making a free elliptical incision and a submucous fibroid nodule about the size of a walnut was removed. The endometrium was thickened and fungous and was thoroughly curetted through the incision. The opening was then closed with Pagenstecher sutures and the displacement corrected by performing the Webster-Baldy operation. This patient was entirely relieved of all of her symptoms and is now in excellent health. In a letter just received she says she has gained in weight, walks three miles a day and suffers practically no pain with periods.

Resection offered the only satisfactory method of dealing with this case. In the first place the exact pathology would have had to be a matter of conjecture unless the uterus were examined by direct inspection and palpation, as the tumor presented on the interior of the uterus and its detection by bimanual examination was practically impossible, as the only sign elicited was a

slight enlargement. But even though the diagnosis were easy, its removal by the genital route in a virgin would have been attended with the greatest difficulty and danger.

INDICATIONS

As to the indications for this operation, we approach it from two points of view. First, incision of the uterus to expose the cavity. This presents a comparatively wide field of usefulness. We have to admit that even after making the most painstaking examination we are not infrequently in doubt as to the exact pathology. In a case of doubt it is a very easy and safe procedure to incise the uterus and inspect and palpate the cavity directly, and this is certainly indicated where the alternative proposition would be the removal of the uterus and the subsequent study of the pathology. These points and others are clearly brought out in Deaver's paper on "Anterior Transperitoneal Hysterotomy."

Second, resection and reconstruction of the uterus. We must admit that the application of this procedure is necessarily limited. However, in certain conditions it would appear to be clearly indicated in preference to removal of submucous fibroids that are still within the cavity of the uterus and also in preference to myomectomies, provided the tumors lie in such a way that they can all be removed by resection. In young unmarried women and in married women who have not had children, we would be justified in resorting to this operation in preference to hysterectomy, even though it entail the risk of another operation on account of fibroids that may develop. Every case has, of course, to be judged on its merits, and perhaps not many will arise in which we can practice this method. Certainly I have found this so in my own practice. But by study of the anatomy and pathology with the uterus in the hand and under the eye it is possible in some cases to secure very gratifying results.

THE USE OF CONTINUED EXTENSION BY MEANS OF A NEW EXTENSION FRAME IN THE BLOODLESS REDUCTION OF CONGENITAL DISLOCATION OF THE HIP

By JOHN W. CHURCHMAN, M.D., F.A.C.S., New Haven
Professor of Surgery, Yale University

IN his publications on congenital dislocation of the hip, Lorenz described so completely the pathology of the condition and indicated so well the best technique to be used in its treatment that this chapter of surgery might be regarded as closed. So excellent were the results of his method in his own hands that since his time, under the limitations distinctly set for the procedure by Lorenz himself, bloodless reduction has been — considering the difficulties to be met — one of the most successful of surgical procedures. According to Lorenz's own figures, 52.6 per cent of 680 cases were cured; extraordinarily good results for an extraordinarily bad deformity. In spite of these facts the method of bloodless reduction is not without its drawbacks. The impression of brutality made when one witnesses for the first time a hip thus reduced, is a thing not soon forgotten. The formation of subcutaneous hæmotomata from manipulations vigorous enough to result in rupture of structure is indeed the indication of a treatment of the tissues so violent as to be not without its dangers. These dangers were fully appreciated by Lorenz himself and were described in his monograph. The first of these dangers is a death rate from anæsthesia, associated with the violence of the manipulations under the anæsthetic, and higher than would be explained by the anæsthetic alone. This fact of itself is sufficient cause for desiring to do away with forced manipulation, if equally good results can be obtained without it. But in addition to the occasional deaths from this cause, Lorenz called attention to a number of other accidents which have resulted from the forcible manipulations necessary in bloodless reduction. In the 450 cases which he reviewed the following complicating accidents occurred:

Fracture of the neck of the femur	11
Fracture of the pelvis	3
Peroneal paralysis (temporary)	3
Crural paralysis (temporary)	5
Sciatic paralysis (permanent)	3
Rupture of the femoral artery without gangrene	1
Gangrene requiring amputation of the hip	1

The modification of the Lorenz technique which I wish to suggest in this paper and to illustrate by a case recently treated, aims to eliminate the risks, while adhering to the principle, of the technique; and to do this by substituting for the violent manipulations under anæsthesia a rather gradual extension. I am perfectly well aware that methods of continuous extension have been previously employed, but as I have tried to make clear in the title of this article, my own suggestion is not to *replace* the Lorenz method by a method of continuous extension, but simply to *substitute* for the purely manipulative procedure of Lorenz, the gradual method of continuous extension. For this purpose a new type of extension frame has been devised, and by its use it has been possible to do what I have never hitherto accomplished, namely to put extension on the leg in any desired position of abduction and at the same time to keep up any desired type of rotation. By use of this frame the position of the leg, so far as abduction or adduction is concerned, may be changed at will, and when so changed the straps which are maintaining rotation may also be readily and instantly changed. We have found that by using this type of extension frame the muscles may be stretched gradually, just as in the Lorenz method they are stretched suddenly, to any desired degree and absolutely without pain; and that the head of the femur may be gradually laid into the position desired, purely by the method of extension and rotation, or by these methods

Fig. 1. Deformity presented on admission.
Fig. 2. Position of femoral heads on admission.

supplemented by the slightest possible manipulation of the head of the femur.

The reduction of the dislocation having been brought about in the manner described, the case must be handled exactly as indicated by Lorenz; for it is an error to imagine that the Lorenz method of hip reduction consists only in manipulative procedure, and does not include the fixation of the reduced femur in such fashion as to lead to pressure of the femur on the acetabulum by supporting the body weight. It should, therefore,

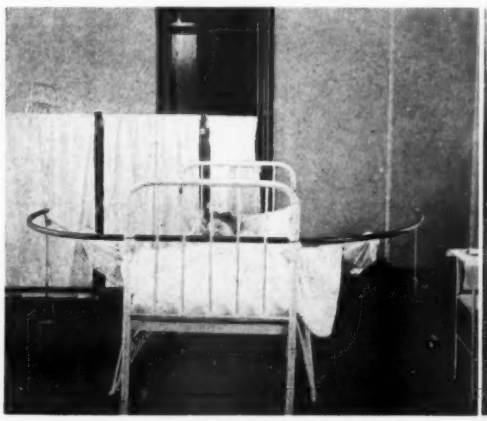

Fig. 3. Extension frame applied to foot of bed, legs abducted to form with each other an angle of practically 180°. The pins carrying the weight pulleys are shown attached close to the end of the extension frame (position on December 7, see diagram, Fig 13.)

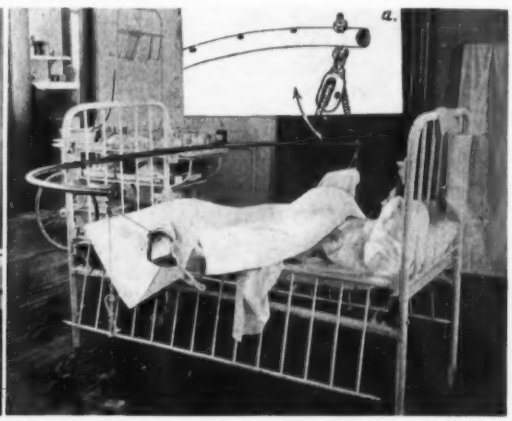

Fig. 4. Lateral view of apparatus. The small drawing *a* shows a detail of the end of the extension frame to illustrate the manner in which the extension pulley is attached to the frame.

Fig. 5. Extension frame at head of bed. Legs abducted so as to form with each other an angle greater than 180°. Picture illustrates the use of a second mattress to keep child from slipping down in bed. Notice rotation straps on left leg, giving marked internal rotation.

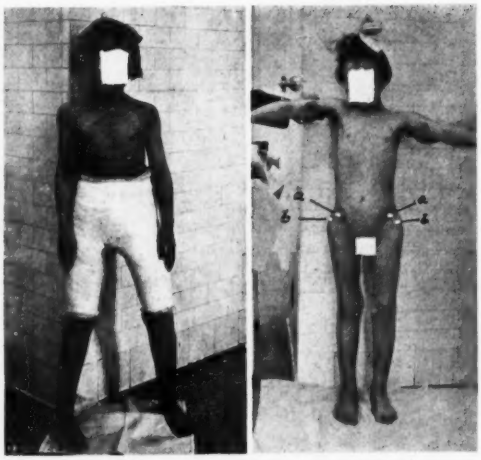

Fig. 6 (at left). Degree of abduction in which plaster cast was applied to allow patient to walk.
Fig. 7. Position at present.

hardly be necessary to say that the modification in treatment here suggested does not make the bloodless reduction of hips a method applicable to cases which are not also suitable for the Lorenz method. Both methods are subject to the same conditions, though it is possible that a few cases which cannot be reduced by manipulation in one sitting, may yield to this gradual form of treatment. The limitations of the bloodless method of reduction were clearly understood and stated by Lorenz and he made it plain that in a large group of cases, particularly after the eighth year, a cure in the anatomical sense, could not be obtained, and that only anterior transposition could be hoped for.

The patient reported in this article was a rather poor case on which to try a modification of treatment, for she was eight years old: at the age, that is to say, when the chance of success becomes doubtful. In addition to this the acetabula were so shallow that it seemed unlikely that we would be able to hold the femora in position, even if we could get them there. What I hoped to do was to bring the heads of the bones into their normal positions and then, by an open operation, to enlarge the acetabula. The parents of the child refused to give permission for the open operation and we have, therefore, had to get along with practically no acetabula. We were able, however, to demonstrate on this patient that the head of the femur, even in a relatively unfavorable case of this sort can, by means of the extension method, to be presently described, be put at will in practically any position one wishes.

Fig. 8.

Fig. 9.

Fig. 8. Abduction begun, femoral heads in the dorsa ilii well above the acetabula.

Fig. 9. Abduction complete. The right femoral head is opposite the normal acetabulum; the left femoral head on the dorsum of the ilium and the femur lies in anteversion.

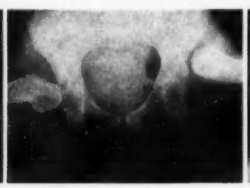

Fig. 10.

Fig. 11.

Fig. 10. Both femoral heads in normal acetabulum; reduction complete.

Fig. 11. Legs brought from position of extreme abduction so as to form with each other an angle of about 35°; femoral heads are opposite the normal acetabula but have been pried outward by the acetabular contents.

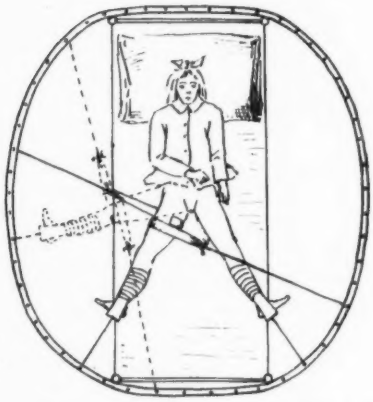

Fig. 12. Extension frame viewed from above, showing extension and rotation straps applied with leg in two different positions.

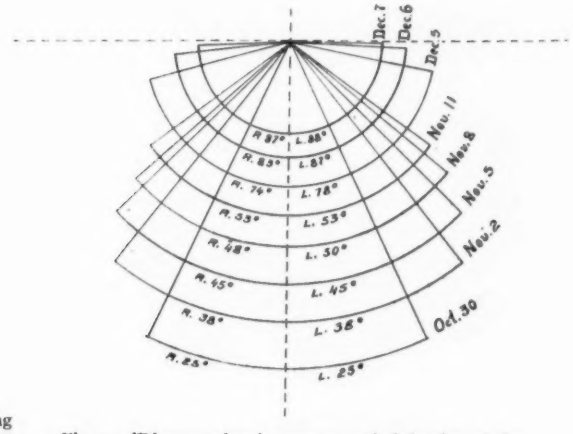

Fig. 13. Diagram showing progress of abduction of the legs.

We kept accurate control of the position of the head by repeated roentgenographs and found that any change of position indicated by these plates as necessary could be readily obtained by changing the direction of the pull of extension or rotation straps. We also demonstrated the value of the extension frame in handling *any* case where extension and rotation were to be applied to a limb at the same time.

The deformity in this patient was typical of a double congenital dislocation, as is shown in Figure 1. The position of the heads in relation to the acetabula is shown in Figure 2, in which it will be seen that on the left side there is a marked anteversion of the neck, probably about 45°, a fact which annoyed us a great deal in handling the case. This degree of anteversion is indeed, according to Durham, a strong if not an insuperable obstacle to the reduction of the deformity.

The extension frame used consisted of a 1¼ inch gas pipe bent into a semicircle. It was perforated at intervals of about two inches with a series of holes for the reception of pins to which were attached pulleys for the weights; these pins were fastened to the frame by nuts and could be in this way placed in any of the holes desired. (See *a*, Fig. 4.) The use of the extension frame when attached to the foot of the bed, is shown in Figures 3 and 4. If abduction beyond a right angle was desired, or if it was found that with abduction nearly at a right angle, the child overcame this abduction by rising in bed, the extension frame was shifted to the *head* of the bed, as shown in Figures 5. In this position abduction to any desired degree could be obtained. For the production of rotation, straps were attached in the usual fashion and these were led to pulleys which could be attached at any point in the frame desired. This description refers to the form of the extension frame which I first used. In its present very satisfactory form it is used as shown in Figure 12, where the frame completely surrounds the bed, and, as one can see at a glance from the diagram, a leg can instantly be put in any position of abduction or rotation. The nursing care of the child may be carried on by having the nurse step within the frame.

By means of an apparatus of this sort the angle of abduction of the two legs, in the patient here described, was gradually increased from October 30 to December 7, as shown in Figure 13. Starting with an angle of 50° we reached by December 7, as will be seen, an angle of practically 180°. During this procedure accurate control of the position of the head of the femur, was kept by means of roentgenographs and the rotation straps thus indicated as necessary were kept constantly applied. As was to be expected the anteversion of the left femur gave us a good deal of annoyance, but I was surprised to find how readily the rotation could be overcome by the continued pull of rotating straps and also to find that when this rotation was finally overcome it seemed to be permanently overcome. It is probably unnecessary to devote so much time as was done in this case to obtaining the degree of right angle abduction required. As we had no experience to go on we proceeded very slowly, but it became evident later that this was an unnecessary waste of time.

A few X-ray pictures taken for control are reproduced to show the progress of the case. The original position is seen in Figure 2. Figure 8 shows abduction begun. Figure 9 shows abduction completed; the right hip is now opposite the normal acetabulum, the left hip still opposite the abnormal acetabulum and in marked position of anteversion. At this stage the patient was given a whiff of chloroform in her bed, and without any difficulty whatever the head of the left femur, by the slightest possible manipulation, was slipped into its proper position. In Figure 10 both heads are shown in their normal position, the dislocation has been reduced and the anteversion of the left hip has been overcome. At this stage it is necessary to begin to reduce the abduction by moving the extension pins on the frame toward the mid-line, and to bring the legs gradually into such position that when the plaster cast is applied the child may be allowed to walk and thus to transmit the body weight through the heads of the femurs to the acetabula. In Figure 11 the abduction has been in this way, to a large extent, reduced. It will be seen that the material with which the acetabula are doubtless filled (this was a point which Lorenz brought out in his study of pathological specimens of this condition) has pried the heads of the bones out and the position is not quite so good as in Figure 10. Undoubtedly operative intervention at this point was indicated in order to hollow out the acetabula, but permission for such intervention was refused by the parents. The position of the hips at this time in the plaster cast, and a few days later when the plaster cast was removed is shown in Figures 6 and 7. In Figure 7 the anterior superior spines and the great trochanters have been marked *a* and *b* and it is seen that a fairly good anatomical result with an excellent cosmetic result has been obtained.

The method here described consists briefly in:

1. Application of extension in the lines of the legs as they rest in their deformed position.
2. Gradual abduction until the legs form with each other an angle of 180.°
3. When maximum abduction has been produced, digital manipulation of the heads of the femurs to drop them into place.
4. Maintenance throughout of rotation necessary to keep the toes pointing directly upward.
5. Gradual reduction of the maximum abduction produced, until the legs form with each other an angle of about 35.°
6. Application of plaster cast from the waist to the knees.
7. Transmission of the body weight to the acetabula, through the heads of the femurs, by allowing the child to walk.

If a favorable case in a young infant with well developed acetabula is treated in this way, not only will the case be simplified by eliminating the violent manipulations hitherto used, but more accurate results will probably be obtained because it will be found that the head can in this way be at will placed exactly where one wishes it to lie, and that if the position is, by roentgenographs, shown to be not entirely satisfactory, a change in the direction of the extension or rotation straps will make the desired correction.

A GAUZE SPONGE SPONTANEOUSLY EXPELLED FROM THE URINARY BLADDER[1]

By G. PAUL LaROQUE, M.D., F.A.C.S., Richmond, Virginia

THE case herewith reported is interesting clinically from the standpoint of painful spasm of the bladder, pus in the urine and a palpable mass in the right side of the pelvis; academically because of its rarity; and practically interesting from several standpoints.

In April, 1918, Dr. W., of North Carolina, brought to the Memorial Hospital a young widow, age 34, who had never been pregnant, complaining of violent pain of the vesical tenesmus type, in the middle and both sides of the lower abdomen, radiating to both lumbar regions accompanied by the discharge from the bladder in periods varying from every few minutes to an hour, of foul-smelling pus and blood mixed with urine. This woman had been perfectly well since childhood except for dysmenorrhœa and some other pelvic symptoms for which she had been operated upon five years ago by a doctor with some experience in surgery in a North Carolina city. She says that her left ovary was removed on account of a cyst, the uterus suspended and the appendix removed. The wound was completely closed without drainage. The operation was successful in relieving her pre-existing menstrual symptoms and she remained in perfect health ever since until the beginning of the present trouble. She has lived the normal life of a well-to-do woman, she is fond of automobile driving and other outdoor sports. Her menses have been regular, painless and otherwise normal; she has not had leucorrhœa, or irritability of bladder, no indigestion, or other symptoms.

[1] Read before the Southern Surgical Association, Baltimore, December 17, 1918.

Ten days before admission, quite suddenly and without apparent cause, she was seized with a frequent desire to urinate. She had considerable pain before, during, and after urination, constant pain in the lower abdomen. The urine was foul and contained considerable sediment and was passed a little at a time at intervals of one-half to one hour, night and day. She sought relief immediately and Dr. W. after applying the usual remedies without improvement, brought her in for examination and treatment.

During the night on her trip to the hospital two large doses of morphine and hyoscine had to be administered on account of tenesmus. Upon admission to the hospital the pain was agonizing, the foul odor and frequency of urination were equally embarrassing to her refined and modest temperament. In spite of her fortitude she exhibited a distressing appearance. Her temperature was normal, pulse 90. A thorough examination of her entire body revealed no evidence of disease except in the pelvis and a slight amount of tenderness in the right lumbar region.

Vaginal examination showed tenderness most marked in the region of the bladder. The uterus was in normal position and freely movable. In the right vaginal fornix a distinct mass was palpable and quite tender. Examination of a catheterized specimen of urine showed it to be three-fourths pus. Examination of a filtered specimen showed it to be acid in reaction, containing an abundance of albumin, pus and blood, but no casts or other renal elements. The urine was dribbling away constantly, could not be retained and every half hour or so, coincident with a spasm of the bladder, she would expel sometimes as much as three or four ounces. X-ray examination made the next day showed a slight enlargement of the right kidney, a normal left kidney and a vague diffuse shadow in the true pelvis. No stone was present in any part of the urinary tract and there was nothing characteristic about the shadow in the pelvis. Dr. A. L. Gray, the roentgenologist, was quite satisfied when he saw a specimen of the pus containing urine that this in the bladder could easily account for the shadow in the pelvis. Her temperature the next day was 101°, pulse 100. There was at no time any evidence of kidney colic, nor kidney tenderness.

At this point we were quite puzzled. The mass felt in the right vaginal fornix, of course, felt quite like an enlarged ovary or tube. We frequently see pus in urine in cases of inflammation of a tube and ovary, though I have never seen such pus-containing urine as this, caused by such pathology. Moreover she had no vaginal discharge nor menstrual symptoms indicative of disease of the uterus, tubes or ovaries. I tried for two or three days to urge myself into making a cystoscopic examination but the agonizing pain which the woman suffered at all times and especially whenever her bladder contained as much as two or three ounces, caused me to believe it would not have been made without a general anæsthetic, and I continued to postpone it from day to day. With the usual drugs directed to the relief of vesical tenesmus, no relief was obtained and even with morphine sometimes combined with atropine and with hyoscine, there was no relief for more than two hours. Several vaginal examinations revealed the same mass in the right fornix. We were genuinely puzzled as to whether to do vaginal cystotomy or to operate upon the abdomen, and temporized from day to day. Four days after she came to the hospital she suffered retention of urine and an unsuccessful attempt was made by the nurse to catheterize her. I noticed myself, in using the soft rubber catheter, that it had to be introduced about three inches before urine came. I withdrew a quart of foul pus-containing urine. She continued to suffer the same tenesmus, passing the same kind of urine, though at no time was her temperature above 101° and her pulse ranged from 80 to 110.

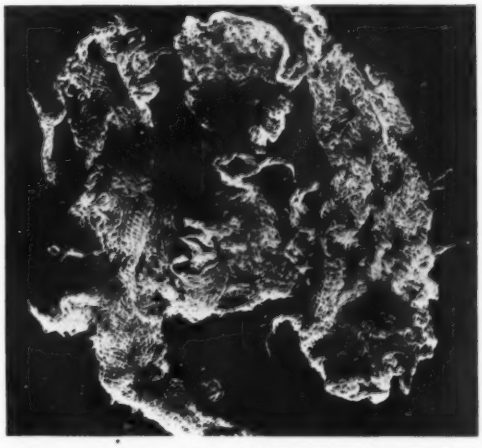

Fig. 1. A gauze sponge 2 inches wide by 10 inches long was spontaneously expelled from the urinary bladder.

Five days later she again had retention and an unsuccessful attempt was made by a nurse to catheterize her. Upon inspection of the meatus I noted a white substance, close examination of which revealed a piece of gauze in the urethra. Twisting this into a rope with my fingers the gauze rag two inches wide and ten inches long here exhibited was removed. Within 12 hours her symptoms were distinctly improved and from day to day the improvement was rapid. In six days she was apparently well, she had no urinary symptoms of any kind, and the urine was clear. Microscopic examination showed only a small quantity of pus. She was walking about and enjoying life as usual. In the meantime a perfectly normal menstrual period had appeared, lasted four days, and ceased. Five days after removing the sponge a cystoscopic examination, painlessly made, showed no evidence of any foreign material in the bladder and no cystitis. The only evidence that the bladder had ever been diseased was shown by a small area to the left of the right ureteral orifice which looked like an almost healed fistula. No mass or other evidence of disease could be detected by vaginal examination. One week after the gauze was removed and three weeks after coming to the hospital she returned to her home a perfectly well woman and has remained well ever since.

SUMMARY

1. A clean small gauze sponge was left in a clean pelvis.

2. No symptoms of any kind resulted during an after period of five years.

3. Sudden apparently causeless onset of bladder tenesmus and suppuration was followed in three weeks by spontaneous expulsion of the sponge to the meatus and easy delivery was accomplished by traction with the fingers.

4. Instant relief of tenesmus and rapid and complete subsidence of all symptoms and in a week spontaneous closure of the fistula through which the gauze had ulcerated into the bladder.

TRANSACTIONS OF SOCIETIES

CHICAGO SURGICAL SOCIETY

REGULAR MEETING, DECEMBER 6, 1918, WITH DR. THOMAS J. SULLIVAN, PRESIDING

PAPILLOMA OF THE LARGE BOWEL

DR. JACOB FRANK: I wish to report a case of a rare type of papilloma, and my reason for doing so is that at a previous meeting of the society Dr. Bevan reported a case of papilloma that he had removed from a patient in the Presbyterian Hospital, which was diagnosed by Dr. Sippy.

A peculiar thing about this case is that the patient, a man, 49 years of age, did not have any hæmorrhages, and hæmorrhage was one of the main features in making the diagnosis in Dr. Bevan's case. This man suffered from a large mass situated in the left iliac region. The sigmoid was attached to the abdominal wall and was firmly fixed there by a hard mass. I asked the patient whether he had had any hæmorrhage from the bowels and he replied, no; but his condition became so serious, that he was anxious to have an operation. I removed the mass, practically dug it out, and made an end-to-end anastomosis with one of my bone couplers, with Lembert sutures over it. About the tenth day after the operation, in looking for the rubber to pass, instead of the rubber, I removed with my fingers from the rectum the softened collars made of bone which was incorporated in fæces. I removed so much of the abdominal wall with the peritoneum which left such a large space uncovering the ileum that I had to use drainage. In order to close the abdominal cavity it was necessary to do a plastic of the peritoneum. I put in a Mikulicz drain in the iliac space. The man had no trouble at first, but twelve days afterwards he developed an abscess on the opposite side, which was a colon infection and involved the abdominal wall, and which was not from the abdominal cavity. At the time I removed this specimen, believing it to be a carcinoma, I looked for enlarged glands, and I remarked at the time that it seemed strange there was none.

The patient has as you will see a postoperative abdominal hernia. He has normal bowel movements.

From the appearance of the tumor, I believe it would not be long before it would have become cancerous from irritation. I believe very soon there would have been a stoma formed to relieve this condition so that the fæces could pass out.

HERNIA

DR FRANK: This man, 56 years of age, presented himself with a hernia, as I thought, larger than my head. He said he had had a hernia for twenty-five years. On examination there seemed to be an impulse about the ring. By percussion I could elicit a thrill through the middle part. Artificial light would not pass through. I was careful to notice whether it was a case of hydrocele with the intestine floating in it. I desired to make a positive diagnosis, but was unable to do so. I thought the patient had a hernia, because he said he had had one, and I could feel a faint impulse on coughing just at the ring. He was anæsthetized. A small trocar was introduced and blood fluid was withdrawn. When the tumor became relaxed I could feel a normal testicle on the opposite side, but on the side with the tumor the testicle was flattened and hard after removing considerable fluid and organized blood clot. Some of the fluid was sent to the laboratory and it was found sterile. The part was isolated and a regular herniotomy incision made.

I worked around the sac. Within the sac were the cæcum, the appendix, and part of the small intestines. Fortunately there were no adhesions. I put clamps on the neck of the sac, cut it off, pushed it down and finished the operation with modified Bassini technique. I removed the entire sac with the testicle and cord high up.

With your permission, Dr. Sweeney will report on the pathology and the literature.

DR. SWEENEY: This specimen Dr. Frank has brought down is very rare. We became intensely interested in it and devoted considerable time in seeking the origin of the tumor. We have here the testicle and on the surface apparently, the cæcum, the appendix and the rectum passing through the inguinal canal. On opening up the testicle we find several areas. We notice a dark circular cyst-like area throughout the whole organ. There is a white fibrous band. The tunica vaginalis is filled with partially clotted blood and hæmatocele. The epididymis is very much enlarged, and I will pass the specimen around so you can examine it for yourselves.

Sections taken from four different areas show various structures, such as a cartilaginous formation, myxomatous tissue, smooth and striated muscular fibers.

STONE IN THE BLADDER

DR. JACOB FRANK: I removed this kidney containing a stone from a woman, 43 years of age, who had been passing blood continuously for sixteen months. She claims never to have had any pain

The stone, a large one, resembles a monkey wrench. Her urine was examined microscopically since the operation but contained no blood. The patient left the hospital the third week.

DISCUSSION

DR. ARTHUR DEAN BEVAN: I have had but a limited experience in handling cases of papilloma of the large intestine. Dr. Frank has referred to a case of which I recently reported in the *Surgical Clinics of Chicago*. That was a single papilloma in the sigmoid and it interested me more from the standpoint of diagnosis than from anything else. I am glad Dr. Sippy is here, because it was his diagnosis which, to my mind, made the case particularly interesting.

I went to the hospital one morning and Dr. Sippy wanted me to remove a papilloma from the middle of the sigmoid. I asked him if he had seen it with the proctoscope and he said he had not; that the diagnosis had been made definitely from a careful analysis of the clinical findings. This woman had for a long time blood in the stool. The blood was not evenly intermixed with the stool, but was blood that would come in clots, and as I remember from the careful analysis which he made, he limited it to that portion of the bowel in which hardened fæcal matter is first formed, and he therefore made the diagnosis of polypus of the sigmoid, excluding definitely, on account of its long standing, carcinoma.

I made a laparotomy at his suggestion, picked up the sigmoid, ran it through my fingers, and could not find anything at first but finally stripping it back and forth I found a good-sized polypus, about the size of the end of my thumb, with a long pedicle. It was easily removed. It was a single polypus, and after its removal the hæmorrhage ceased entirely.

Multiple polypi I have seen several times. I have one case of polypus which produced invagination of the transverse colon. I operated on this case and it presented a very interesting picture. Multiple polypi of the colon present a very serious lesion for the patient because many of these cases terminate fatally. Quite a number of patients live long enough for these polypi to become carcinomatous, hence they are among the most serious lesions of the large bowel.

DR. A. J. OCHSNER: I would like to call attention to a method that I have used for disposing of these large intestinal polypi. The method consists in slitting open the intestine, putting a clamp at the base of the polypus and excising it with the cautery as one would remove a polypus in the rectum, through a proctoscope. The wound in the intestine is then closed. I have tried this method and it works well.

DR. CARL B. DAVIS: A year or more ago a patient that came under my observation was passing blood in the stools at irregular intervals. We made an examination with the proctoscope, but were unable to make a definite diagnosis. We could find nothing. We opened the abdomen and found the ascending, transverse and descending colon studded with polypi. There was hardly any place that was not covered with these polypi. The bowel was not removed. The patient still has polypi of the ascending, transverse, and descending colon; there are probably several hundred in that area. The patient is a man, 35 years of age.

DR. EMIL G. BECK read a paper entitled, "A Simple Method of Arresting Tuberculous Spondylitis, with Demonstrations of Patients and Radiograms."

REGULAR MEETING, JANUARY 3, 1919, WITH DR. THOMAS J. SULLIVAN, PRESIDING.

OSTEOMYELITIS OF THE CLAVICLE

DR. CARL B. DAVIS: A year ago this man was struck by an automobile and developed an osteomyelitis of the clavicle, which was treated from time to time, and the condition finally subsided, leaving him unable to raise the arm. The deltoid muscle has been detached from its clavicular region and has slipped down into the arm. An incision was made parallel with the clavicle below the line of the old scar. A second incision at right angles was carried down over the top of the shoulder until the deltoid was exposed to view. The muscle was found retracted to about one-half its length. A fascial flap was taken from the thigh with a thick layer of subcutaneous fat adherent. The flap was sewed over the shoulder-joint and with the fatty surface down to avoid adhesion of the fascia to the underlying structures. The upper end of the fascia was attached to the trapezius and clavicle. The arm was elevated to as high a point as we could get it, the deltoid pulled up and stitched into the fascia with chromic gut. At the completion of the suture the deltoid did not reach to the clavicular level by three-quarters of an inch. The cast was adjusted with the arm in complete abduction. The man has been out of the cast for a week, and it is gratifying to see the amount of motion he has already. We have started him on wand exercises hoping to speed the function.

NOTE.—On checking over these notes one month later, we might state that the man is able to lift his arm to a horizontal position.

DISCUSSION

DR. CARL BECK: The case of fascial plastic is very interesting, first, because the fascia healed in without reaction, and second, because the patient has a good functional result. This result will improve in the course of time. Unfortunately, fascia is not used as often as it should be in plastic work, and most of the men who use it, do so without the use of fat. Fat is a splendid lubricant, especially when the fascia is used to wrap tissues to protect tendons or nerves that adhere by cicatricial tissue.

ARTERIOVENOUS ANEURISM AFFECTING THE BRACHIAL PLEXUS

DR. LAWRENCE RYAN reported a case of arteriovenous aneurysm affecting the brachial plexus.

E. T., Italian, male, age 27, unmarried; occupation, watchman; has always been well and strong. He has had occasional nycturia but no venereal infection. He drinks wine with his meals, uses very little tea, coffee, or tobacco. He keeps good hours and eats and sleeps normally. On August 5, 1916, while on duty as a watchman, he was shot, the bullet entering the chest at the lower angle of the scapula on the right side. The bullet did not leave the body. He walked about 10 yards and fell unconscious. Profuse hæmoptysis occurred. Several hours later he regained consciousness. His right arm was completely paralyzed. By December, 1916, he had good use of his arm and partial use of the forearm. The hand remained almost useless. Since December, 1916, there has been no improvement in the hand. On August 20, 1916, the right pleural cavity was opened and drained. The empyema cleared up rapidly. On September 16, 1916, an attempt was made to remove the bullet but without success. In December, 1916, a second attempt was made to remove the bullet by another surgeon but again without success. These operations were performed in Pennsylvania. On September 1, 1916, a right sided tinnitus aurium made the patient very uncomfortable. He then noticed a marked thrill in his neck on the right side.

Examination revealed a well nourished man weighing 135 pounds; 5 feet 6 inches tall. The skin and mucosa are normal. No dryness, œdema, or pigmentation are present. There are many distended veins on the neck and head—possibly not abnormal. The right external jugular vein becomes greatly enlarged on compression above the clavicle. The right pupil is smaller than the left. Both react to light and accommodation. The fundi show no abnormal vessels, exudate or hæmorrhage. There are scars of previous operations in the cervical region. A definite, continuous thrill is felt over the vessels on the right side of the neck. The purring sound is continuous and cannot be identified with the heart beat. It appears somewhat more marked on systole. The teeth are good, the tongue is clear, presents no tremor and does not deviate. The throat and nose are clear. The chest is well developed, there is no change on respiratory excursion. There are two scars, one in the right post axillary line and one at the angle of the right scapula. There is no abnormal tactile or vocal fremitus. Breath and bronchial sounds are not pathological. There are no râles. The heart shows no enlargement. The sounds are clear and present no accentuation. Functional test shows no alteration in rhythym and gives a good return to normal. The heart muscle and the endocardium are normal. The pulse is even and compressible. The abdomen is normal. The liver edge is felt at the costal border. The kidneys and spleen are not palpable. There are no prominent veins. The abdominal reflex is normal. The inguinal canals are empty and the rings normal. There are a few bean-sized glands here. The genitals are normal, there are no scars and no urethral discharge. The scrotal reflex is present. The prostate is normal, likewise the rectum. The extremities are normal except the right arm. There is no clubbing of the fingers, scars, pigmentation or œdema. The reflexes react normally. Muscle tone and skin sensation are normal.

The osseous and glandular systems show no changes.

The temperature is 98.6°; pulse 72; blood pressure systolic 120, diastolic 70.

Blood: hæmoglobin, 90 per cent (Tallquist); coagulation time 5 minutes; white blood cells 6,000; red blood cells 4,800,000; no achromia, poikilocytosis or anisocytosis; platelets normal; no parasites. The blood (Wassermann reaction) is negative. The blood nitrogen is 25 mg. per 100 cubic centimeters of blood.

Urine: quantity, normal; reaction, acid; specific gravity, 1.020; no albumin; no sugar, white cells, red cells, casts or bacteria. Renal function: phenolphthalein test, appearance time 10 minutes, 90 per cent in 2 hours.

Stool: guaiac negative.

X-ray shows bullet close to vertebra in the right upper cervical region.

Diagonsis: Arteriovenous aneurism of right cervical vessels. Complicated paralysi of the brachial plexus involving the sixth, seventh, and eighth cervical and the first dorsal nerves producing motor paralysis, sensory, vasomotor and sympathetic changes.

The sympathetic involvement can be accounted for by injury to the rami communicantes of the first dorsal producing the contraction of the right pupil.

The ulnar disturbance is explained by diminished flexion of the hand, especially on the ulnar side. Flexion of the last three fingers is imperfect. The little finger can be moved only slightly. Paralysis of the interossei and the last two lumbricals is evident. There is a suggestion of the claw hand. Sensation of the volar surface of the last two fingers and dorsal surface of last three fingers is lost.

The median nerve shows involvement by reason of the deficient pronation of the forearm and the inability to flex the terminal phalanges of the fingers.

The shiny, bluish condition of the hand, the thermic changes, account for the vasomotor alteration.

The last operation was performed with the indications in view of first benefiting the paresis of the right hand, through the location or correction of a lesion of the right brachial plexus or second, what seemed more probable, the location of the arteriovenous aneurism and its removal, or a possible ligation. It was hoped that this would effect a cure by relief of the pressure caused by the aneurism.

This latter view was strongly favored by a report

of a very similar case, the result of gunshot, reported to this society at its March meeting of 1918 by Dr. Paul Morf.

The operation was performed by the writer, June 10, 1918, at the Frances Willard Hospital and was prolonged and tedious on account of the great amount of scar tissue—the result of the two previous operations, in this locality, and because of the pernicious hæmorrhage that accompanied the slightest cut. This was due to the extreme dilatation of the internal jugular and all its branches and communications even to the smallest venule.

The incision was carried down the right side of the neck from a point about the center of the right cervical region, anterior to the sternocleidomastoid muscle, to the clavicle and then along the upper surface of the clavicle toward the median line. This V-shaped trapdoor of skin and subcutaneous tissue was retracted upward and inward, and an attempt made to isolate the internal jugular vein and the common carotid artery.

The dissection over the upper part of this area located the bullet that could be readily felt through the unbroken skin. It was a soft lead 36-calibre ball. The "nose" had a decided split in it, the result probably of hitting a process lower down and then being deflected upward.

The internal jugular vein was enlarged to 3 or 4 times its normal size. The common carotid was pulseless, small and cord-like from one end of the wound to the other. The thrill was still present and was more marked at the root of the neck.

The operation could not be completed nor the source of the trouble reached without enlarging the wound area. An additional incision was made across the center of the clavicle and downward for 4 inches below it. The clavicle was then resected at the junction of the inner and central thirds and the inner one third of the clavicle was turned inward.

The thrill was still palpable as far down behind the first rib as the index finger could reach. The communication between the internal jugular vein and the common carotid was in the common carotid artery very low down. It was close to the origin of the subclavicular artery, or may have been lower down. The subclavian pulsations were normal. The right common carotid artery was pulseless, small and cord-like, proximal to the communication with the internal jugular vein. It was then decided to ligate the internal jugular as low down as possible. This was done by two ligatures. The subclavian vein was also ligated on account of hæmorrhage. The internal jugular was clamped and cut off above the ligatures at the root of the neck and removed as high up as the center of the cervical region. The upper ligation was very difficult on account of the great dilatation of the jugular and the thinness of its walls.

In this attempt a severe hæmorrhage occurred. It would probably have been safer as regards the immediate result to have tied at intervals the internal jugular, instead of resecting it. Its resection was undertaken on account of the report on vessel ligation, read before this society some years ago by Dr. Donald McClain of Detroit. He advocated, at that time, the removal of a section of a vessel rather than to trust to a ligation or multiple ligations for the occlusion of the vessel.

After this loss of blood artificial respiration had to be resorted to and the wound was exposed to some contamination.

The fifth, sixth and seventh nerve roots were exposed in the open wound before the closure and also a portion of the eighth root. They were wholly normal in appearance. Whether they may have been injured distally from the wound areas is only conjecture.

The clavicle was reunited by means of chronic catgut and the wound closed in the usual manner.

The patient's recovery was uneventful except for some necrosis of one end of the resected clavicle. This readily cleared up resulting in fibrous union and considerable deformity of the clavicle at the point of resection. The function of the shoulder is perfect.

January 4, 1919, examination shows the thrill and pulsation absent.

The nerve condition as relates to the hand is unchanged—I can see no improvement and the patient sees none.

Two recent similar cases have been brought to my notice. The case of Dr. Morf and a case reported early in 1918 by Dr. Richard Cabot in his case records. The case is reported in detail. This was possible because he had access to the autopsy records. Dr. Cabot's case was the result of a gunshot, that produced almost identical nerve degenerations with those found in Dr. Morf's case and in the present case. In the Cabot case an aneurism of the injured vessel was found. A consultant staff of six surgeons of the Massachusetts General Hospital advised against an operation six months before. The persistence and growth of the aneurism caused them to reverse their former advice.

An attempt was made to ligate the internal jugular proximal to the aneurism. A severe hæmorrhage occurred. The patient died a few hours later from shock. The postmortem showed no gross lesion of the roots nor of the plexus other than the degenerative changes caused by pressure.

CORRESPONDENCE

ACCIDENTS FROM LOCAL ANÆSTHESIA

To the Editor: In 1913, I observed a death following the injection of novocaine.

A man, age 42, had suffered for some time with stomach trouble, probably caused by an epigastric hernia. His general condition was good. The man was not very fat, his lungs, heart, and kidneys were normal. On percussion the liver was found to be palpable and enlarged. Six centimeters above the umbilicus there was a swelling in the middle line. The swelling could be reduced by pressure but it was painful. An opening of about 1.5 centimeters was felt in the linea alba. I planned to operate on this patient on April 25. At 7:30 a.m., an injection of 10 milligrams of morphine was given in the forearm. At 8:30 the man was placed on a horizontal table. The skin was disinfected with iodine. An injection of ½ per cent novocaine with 1:100,000 adrenalin was given. When my assistant put in the needle the patient seemed to be nervous. His face and limbs turned pale and the pulse was small and weak before more than 1 or 2 cubic centimeters were injected. My assistant, who was an expert in administering local anæsthetics, then waited a moment. After a few minutes he continued the injection and the man grew miserable again. At this moment a quantity of not more than a half cubic centimeter was injected. My assistant again waited and the patient seemed to recover, but not for long. He soon became miserable again and suddenly rolled off the table and fell on the floor hurting his nose. He was very cyanotic and breathed convulsively. The pulse was very small and weak. In spite of injections of ol. camphoratum, massage of the heart and artificial respiration with my special apparatus, the patient died in a few minutes.

Postmortem examination. The patient is of normal stature. There is a swelling in the linea alba, 4 fingers above the umbilicus, around which are eight stab wounds from the needle, extending in a circle from the umbilicus halfway to the xiphoid process of the sternum. The swelling consists of preperitoneal fat and slips through an opening in the fascia. Situs viscerum normal. The omentum is free throughout the intestines. The peritoneum looks bright. No ascites present. The diaphragm on the right side is at the fourth rib and on the left at the fifth rib. The left lung collapses and is totally free. The right lung has many soft adhesions to the costal pleura and collapses not so well as the left lung. No hydrothorax is present. In the precardium there is slight hydrops. The left venous orifice three fingers, the left four. The foramen oval is open and is about 1.5 centimeters in diameter. The heart is soft. The valves are normal. Both lungs are very plethoric. There is no œdema or signs of tuberculosis or inflammation. The stomach is large, the appendix normal. The kidneys are very lobed, but the inner surface is normal (450 gr.). The spleen is large (230 gr.). The liver is large, the intersection normal. The testicles are small and in the scrotum. The thyroid is not enlarged; no thymus persistens. No swollen glands. Number of papillæ circumvallatæ normal.

The cause of death is not easy to explain. Was it due to nervous shock or to an acute intoxication? There was a slight indication of so-called status lymphaticus, the kidneys being lobed and the foramen ovale open. Therefore, we may suppose that with these conditions present the narcotic would have a greater effect than in a normal case. However, the nervous shock caused by the prick of the needle had already passed and the injection was completed before the real collapse occurred. If death was due to an intoxication, the time between the injections and death was very short and the dose of novocaine small.

In more than 6,000 cases I have injected the same or larger doses, and I have observed in cases of a serious nature — such as in gynecological operations where it is necessary to anæsthetize the pelvic region — a kind of shock one or two hours after the operation, and sometimes, even when smaller doses were used, there was a reaction during the operation. In such cases the patient turns pale and the blood pressure is diminished. I take it that these symptoms are the effect on the circulatory system of the combination of the intoxication and the reaction from the operation. Such phenomena often appear just at the moment when the surgeon pulls the intestines out of the abdomen or hugs the peritoneum during a herniotomy and sometimes when the mesenteriolum of the appendix is squeezed together. In all of these cases a reflex is to be expected, the nerves not being blocked at all.

Even in making skin incisions and in cutting the subcutaneous tissue, when there is no perception of pain at all, I have sometimes observed the same reaction. In the case reported the whole procedure took place some time before the operation. It is possible that some novocaine was immediately injected into the vein. This is not probable, however. The veins near the linea alba are not very large and the technique used by my assistant prevents such an accident, as he moves the needle during the injection.

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